Report No. FAA-RD-79-9

COMPARISON OF MEASURED DATA WITH IF-77 PROPAGATION MODEL PREDICTIONS

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16. Abstract

This report provides extensive comparisons of measured propagation data with predictions made by the IF-77 (ITS-FAA-77) and other propagation models. Although IF-77 was developed for aeronautical applications, it can be used for some point-to-point propagation paths, and the measured data selected for comparison includes point-to-point as well as aeronautical paths.

Approximately 870,000 hours of data are associated with the 242 paths used. Predictions made with IF-77 were always best or second best and were substantially better than those made for free space conditions. The IF-77 model has a wide range of application and provides predictions compatible with the more specialized models tested.

A discussion of the aeronautical propagation data pool from which the data were selected is included as an appendix.

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ENGLISH/METRIC CONVERSION FACTORS

LENGTH

From \ To	cm	m	km	in	ft	mi	nmi
cm	1	0.01	$1x10^{-5}$	0.3937	0.0328	$6.21x10^{-6}$	$5.39x10^{-6}$
m	100	1	0.001	39.37	3.281	0.0006	0.0005
km	100,000	1000	1	39370	3281	0.6214	0.5396
in	2.540	0.0254	$2.54x10^{-5}$	1	0.0833	$1.58x10^{-5}$	$1.37x10^{-5}$
ft	30.48	0.3048	$3.05x10^{-4}$	12	1	$1.89x10^{-4}$	$1.64x10^{-4}$
mi	160,900	1609	1.609	63360	5280	1	0.8688
nmi	185,200	1852	1.852	72930	6076	1.151	1

AREA

From \ To	cm²	m²	km²	in²	ft²	mi²	nmi²
cm²	1	0.0001	$1x10^{-10}$	0.1550	0.0011	$3.86x10^{-11}$	$5.11x10^{-11}$
m²	10,000	1	$1x10^{-6}$	1550	10.76	$3.86x10^{-7}$	$5.11x10^{-7}$
km²	$1x10^{10}$	$1x10^{6}$	1	$1.55x10^{9}$	$1.08x10^{7}$	0.3861	0.2914
in²	6.452	0.0006	$6.45x10^{-10}$	1	0.0069	$2.49x10^{-10}$	$1.88x10^{-10}$
ft²	929.0	0.0929	$9.29x10^{-8}$	144	1	$3.59x10^{-8}$	$2.71x10^{-8}$
mi²	$2.59x10^{10}$	$2.59x10^{6}$	2.590	$4.01x10^{9}$	$2.79x10^{7}$	1	0.7548
nmi²	$3.43x10^{10}$	$3.43x10^{6}$	3.432	$5.31x10^{9}$	$3.70x10^{7}$	1.325	1

VOLUME

From \ To	cm³	liter	m³	in³	ft³	yd³	fl. oz.	fl. pt.	fl. qt.	gal.
cm³	1	0.001	$1x10^{-6}$	0.0610	$3.53x10^{-5}$	$1.31x10^{-6}$	0.0338	0.0021	0.0010	0.0002
liter	1000	1	0.001	61.02	0.0353	0.0013	33.81	2.113	1.057	0.2642
m³	$1x10^{6}$	1000	1	61,000	35.31	1.308	33,800	2113	1057	264.2
in³	16.39	0.0163	$1.64x10^{-5}$	1	0.0006	$2.14x10^{-5}$	0.5541	0.0346	2113	0.0043
ft³	28,300	28.32	0.0283	1728	1	0.0370	957.5	59.84	0.01/3	7.481
yd³	765,000	764.5	0.7646	46700	27	1	25900	1616	807.9	202.0
fl. oz.	29.57	0.2957	$2.96x10^{-5}$	1.805	0.0010	$3.87x10^{-5}$	1	0.0625	0.0312	0.0078
fl. pt.	473.2	0.4732	0.0005	28.88	0.0167	0.0006	16	1	0.5000	0.1250
fl. qt.	946.4	0.9463	0.0009	57.75	0.0334	0.0012	32	2	1	0.2500
gal.	3785	3.785	0.0038	231.0	0.1337	0.0050	128	8	4	1

MASS

From \ To	g	kg	oz	lb	ton
g	1	0.001	0.0353	0.0022	$1.10x10^{-6}$
kg	1000	1	35.27	2.205	0.0011
oz	28.35	0.0283	1	0.0625	$3.12x10^{-5}$
lb	453.6	0.4536	16	1	0.0005
ton	907,000	907.2	32,000	2000	1

TEMPERATURE

$$°C = 5/9\,(°F - 32)$$

$$°F = 9/5\,(°C) + 32$$

FEDERAL AVIATION ADMINISTRATION
SYSTEMS RESEARCH AND DEVELOPMENT SERVICE
SPECTRUM MANAGEMENT STAFF

STATEMENT OF MISSION

The mission of the Spectrum Management Staff is to assist the Department of State, National Telecommunications and Information Administration, and the Federal Communications Commission in assuring the FAA's and the nation's aviation interests with sufficient protected electromagnetic telecommunications resources throughout the world and to provide for the safe conduct of aeronautical flight by fostering effective and efficient use of a natural resource - the electromagnetic radio frequency spectrum.

This objective is achieved through the following services:

- Planning and defending the acquisition and retention of sufficient radio frequency spectrum to support the aeronautical interests of the nation, at home and abroad, and spectrum standardization for the world's aviation community.

- Providing research, analysis, engineering, and evaluation in the development of spectrum related policy, planning, standards, criteria, measurement equipment, and measurement techniques.

- Conducting electromagnetic compatibility analyses to determine intra/intersystem viability and design parameters, to assure certification of adequate spectrum to support system operational use and projected growth patterns, to defend aeronautical services spectrum from encroachment by others, and to provide for the efficient use of the aeronautical spectrum.

- Developing automated frequency selection computer programs/routines to provide frequency planning, frequency assignment, and spectrum analysis capabilities in the spectrum supporting the National Airspace System.

- Providing spectrum management consultation, assistance, and guidance to all aviation interests, users, and providers of equipment and services, both national and international.

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COMPARISON OF MEASURED DATA WITH IF-77 PROPAGATION MODEL PREDICTIONS

M. E. Johnson and G. D. Gierhart[1]

1. INTRODUCTION

Assignments for aeronautical radio in the radio frequency spectrum must provide reliable services for an increasing air traffic density [18].[2] Potential interference between facilities operating on the same or on adjacent channels must be considered in expanding present services to meet future demands. Service quality depends on many factors including the desired-to-undesired signal ratio at the receiver. This ratio varies with receiver location and time even when other parameters, such as antenna gain and radiated powers, are fixed.

The IF-77 (ITS-FAA-1977) propagation model described in Section 3 was developed by the Institute for Telecommunication Sciences (ITS) under sponsorship of the Federal Aviation Administration (FAA). It has been incorporated into ten computer programs that are useful in estimating the service coverage of radio systems operating in the frequency band from 0.1 to 20 GHz. They may be used to obtain a wide variety of computer-generated microfilm plots [20]. The capabilities and input requirements of these programs are discussed in an Applications Guide [21].

Extensive comparisons of measured data with predictions made by IF-77 and other models are provided in Section 4. They supplement similar comparisons previously provided by Smith [36]. Because they are so voluminous, the Summary and Conclusions

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[2] References are listed alphabetically by author at the end of the report so that reference numbers do not appear sequentially in the text.

have been placed as Section 2. The aeronautical data pool from which these data were selected is discussed in Appendix A. A guide to the abbreviations, acronyms, and symbols used in this report is provided in Appendix B.

2. SUMMARY AND CONCLUSIONS

Extensive comparisons of measured radio propagation data with predictions made by IF-77 and other models are provided. Data from four sources were used. This includes data provided in two reports (FAA-RD-75-165,I [12] and OT/TRER 16 [26]), data collected utilizing the Midwest Program on Airborne Television Instruction (MPATI) aircraft [13], and unpublished data obtained with the ITS Radio Spectrum Measurement System (RSMS). A summary of the data used is provided in Table 1. Only those paths for which the IF-77 model is applicable were selected for comparison. For example, only about 25 percent of the paths in OT/TRER 16 were suitable since the IF-77 model is not applicable to paths with two horizons formed by irregular terrain (Sec. 3). To facilitate additional work with these data such as comparison

Table 1. Summary of Data Used*

Source	Data Type	Paths	Data Hours
FAA-RD-75-165,I (Sec. 4.1)	Ground-to-air (instantaneous levels)	28	20
MPATI (Sec. 4.2)	Air-to-ground (hourly medians)	6	4,130
OT/TRER 16 (Sec. 4.3)	Ground-to-ground (hourly medians)	202	866,000
RSMS (Sec. 4.4)	Ground-to-ground (hourly medians)	6	167
	TOTALS	242	870,317

*Limited to the paths and hours used for comparison with predictions in this report.

with predictions made by other models, we have included the actual data and terrain profiles from the source documents as well as path prediction parameters.

Except for the Section 4.1 data, the data sources contained comparisons with predictions made using models other than IF-77. These have been retained so that IF-77 predictions can be compared with both data and predictions using other models. However, the only predictions that are compared with all data are those made with the IF-77 and Free Space models. A summary of the prediction models is provided in Table 2.

Statistics for the difference, ΔL, between prediction and observation are provided for the data of Sections 4.2 through 4.4. Such statistics were not developed for the Section 4.1 data because (1) sufficient data to estimate median values were not available, and (2) the aircraft antenna pattern is unknown so that an isotropic aircraft antenna was assumed in the predictions. Composite statistics for ΔL are provided in Table 3.

Conclusions may be summarized as follows:

(1) Although, as previously mentioned, ΔL statistics were not developed for the FAA-RD-75-165,I data, the comparisons provided in Section 4.1 indicate that the IF-77 model provides better predictions than the free space model even when line-of-sight conditions prevail. The differences between measured and predicted curves would be expected to be less if the aircraft antenna pattern could have been included in the predictions in place of the isotropic pattern that was assumed. Furthermore, the data consisted of a single run for each altitude. It would have been desirable if there had been more runs to show the variability of data.

(2) Statistics for variability of the data were not developed. However, a visual inspection

Table 2. Summary of Prediction Models

Model	Comments
Egli [11]	Used in Section 4.4 only. The Egli model was developed to predict land-mobile radio (LMR) base-to-mobile coverage areas. Terrain profiles are not used so that more complex models that require such information would be expected to yield better results.
ESSA 1970 [25, Sec. 3.5]	Used in Sections 4.3 and 4.4. The ESSA 1970 model is an improved version of the Longley-Rice model for the point-to-point mode where terrain profile information is used to determine horizon parameters. Predictions made with it in Section 4.3 used the same formulation for variability as the TN 101 model.
FCC [8]	Used in Section 4.4 only. The FCC model was developed to predict LMR base-to-mobile coverage areas. If terrain profile information is available, more complex models that utilize it would be expected to yield better results.
Free Space [33, p. 2-7]	Used in Sections 4.1, 4.2, 4.3, and 4.4. Terrain and atmosphere are neglected in the Free Space model so that transmission loss between isotropic antennas depends only on radio frequency, f in MHz, and ray path length, r in km; i.e., basic transmission loss, L_{bf}, is given by $L_{bf} = 32.45 + 20 \log_{10}(fr)$ dB
IF-77 [21]	Used in Sections 4.1, 4.2, 4.3, and 4.4 and described in Section 3. The IF-77 model was developed to accommodate very high antennas (aircraft or satellite) where detailed terrain information for the highest antenna can be neglected. It can be used for paths with low antennas that are line-of-sight, smooth earth, or have a common horizon. This model has much in common with the Longley-Rice and TN 101 models.

Table 2. Summary of Prediction Models
(continued)

Model	Comments
Longley-Rice [24]	Used only in Section 4.4. The Longley-Rice model was developed to predict transmission loss in irregular terrain. It has an "area mode" in which the terrain is described only by a terrain irregularity parameter and a "point-to-point mode" which uses path profile information instead of the terrain parameter to determine horizon parameters. Since the ESSA 1970 model is an improved version of the point-to-point mode, only the area mode was used.
OT/TRER 21 [13, App. A]	Used only in Section 4.2. The OT/TRER 21 is a version of ESSA 1970 that was modified to provide predictions for comparison with the MPATI data. This involved compensation for (1) the high elevation of one terminal (MPATI aircraft at 6 km) and (2) the limited duration (between 9 a.m. and 2 p.m.) of the MPATI transmissions by using a time block formulation for variability [33, Sec. 10].
Okumura [30]	Used only in Section 4.4. The Okumura model was developed to predict base-to-mobile coverage areas. For such an application, it is more complex than the Egli model and less complex than the Longley-Rice model. Although it does include some factors based on terrain profile information, more complex methods that make greater use of terrain profile information would be expected to yield better results when such information is available.
TN 101 [33]	Used only in Section 4.3. The TN 101 model involves using the most appropriate of several methods provided in Technical Note 101. This model is expected to provide good results for ground-to-ground paths when terrain profile information is available, but is not expected to do as well on line-of-sight paths as ESSA 1970.

Table 3. Summary of Results[a]

Model	$\overline{\Delta L}$[b] [dB]	MAX$|\Delta L|$[c] [dB]	Path[d] No.
Best[e]	- 3	-34	11998
IF-77	- 5	-32	11978
Free Space	-34	-96	10260

[a] Compiled using ΔL statistics for different data sources; i.e., MPATI (Table 6), OT/TRER 16 (Table 7), and RSMS (Table 10).

[b] Determined using median basic transmission loss, L_{bm} in dB, or median received power levels, P_R in dBm; i.e.,

$$\Delta L = L_{bm}(\text{predicted}) - L_{bm}(\text{observed}) = P_R(\text{observed}) - P_R(\text{predicted}) \text{ dB}$$

The mean ΔL for the 193 paths involved is $\overline{\Delta L}$. Only 193 of the 242 paths used had median values for the data.

[c] The ΔL value (sign included) corresponding to the maximum absolute value of ΔL encountered. This statistic picks out the worst ΔL's encountered. The first two identify data that are difficult to explain with any of the models tested, and the last one is a case where free space is simply a poor model since a transhorizon path is involved.

[d] The path number for the path with MAX$|\Delta L|$.

[e] The best model of those tested for the different data sources; i.e., MPATI (OT/TRER 21), OT/TRER 16 (ESSA 1970), and RSMS (IF-77).

of the comparisons indicate that the variability formulation of the IF-77 model does a good job in most cases; i.e., the shapes are in good agreement. In a few specific cases the TN 101 variability formulation (also used for ESSA 1970) provides better agreement with the data, and for a few the opposite is true (see Sec. 4.3 discussion).

(3) The Free Space model was always among the worst predictors. This is as expected since only a few of the paths involved were line-of-sight with good terrain clearance.

(4) The IF-77 model provided the best predictions for the ground-to-air data of Section 4.1 and the ground-to-ground data of Section 4.4. It was second best for the air-to-ground data of Section 4.2 (OT/TRER 21 was best of three) and ground-to-ground data of Section 4.3 (ESSA 1970 was best of four). Hence, it was always one of the best two models and provided predictions better or nearly as good as the other models tested.

(5) The IF-77 model has a wide range of application and provided predictions compatible with the more specialized models tested for the data provided here. However, these comparisons did not include applications such as air-to-air or ground-to-satellite paths, and these additional comparisons would be desirable.

3. THE IF-77 PROPAGATION MODEL

During 1960-1973, an air/ground propagation model applicable to irregular terrain was developed by ITS for the FAA and was documented in detail [15]. This IF-73 (ITS-FAA-1973) propagation model has evolved into the IF-77 model which is applicable to air/ground, air/air, ground/satellite, and air/satellite paths. It can also be used for ground/ground paths that are

line-of-sight, smooth earth, or have a common horizon. Model applications are restricted to telecommunication links operating at radio frequencies from about 0.1 to 20 GHz with antenna heights greater than 1.5 ft (0.5 m). In addition, the elevation of the radio horizon must be less than the elevation of the higher antenna. The radio horizon for the higher antenna is taken either as a common horizon with the lower antenna or as a smooth earth horizon with the same elevation as the lower antenna effective reflecting plane [15, Sec. A.4.1.]. Input parameters for IF-77 are summarized in Table 4 and discussed in the Applications Guide [21, Sec. 4].

At 0.1 to 20 GHz, propagation [2, 4, 9, 10, 32] of radio energy is affected by the lower, nonionized atmosphere (troposphere), specifically by variations in the refractive index of the atmosphere. Atmospheric absorption and attenuation or scattering due to rain become important at SHF [15, Sec. A.4.5; 22, Ch. 7; 33, Ch. 3; 35]. The terrain, along and in the vicinity of the great circle path between transmitter and receiver, also plays an important part. In this frequency range, time and space variations of received signal and interference ratios are best described statistically [29; 33, Sec. 10].

Conceptually, the model is very similar to the Longley-Rice [24] propagation model for propagation over irregular terrain, particularly in that attenuation versus distance curves calculated for the (a) line-of-sight [15, Sec. A.4.2], (b) diffraction [15, Sec. A.4.3], and (c) scatter [16, Sec. 5] regions are blended together to obtain values in transition regions. In addition, the Longley-Rice relationships involving the terrain parameter, Δh, are used to estimate radio horizon parameters when such information is not available from facility siting data [15, Sec. A.4.1]. The model includes allowance for

(a) average ray bending [4, Eqs. 3.44, 3.43, 4.30; 5; 15, p. 44; 33, Sec. 4],

(b) horizon effects [15, Sec. A.4.1],

(c) long-term fading [15, Sec. A.4; 16, Sec. 5; 33, Sec. 10],

Table 4. Input Parameters for IF-77

Parameter	Range
Aircraft (or higher) antenna height above mean sea level (msl).	≥ facility horizon height.
Facility (or lower) antenna height above facility site surface (fss).	> 1.5 ft (0.5 m) above fss.
Frequency	0.1 to 20 GHz.
Specification of the following parameters is optional	
Aircraft antenna type options.	Isotropic* or as specified.
Polarization options.	None, identical with facility.
Tracking options.	Directional* or tracking.
Effective reflection surface elevation above msl.	At fss* or a specified value.
Equivalent isotropically radiated power.	0.0 dBW* or specified.
Facility antenna type options.	Isotropic* or as specified.
Counterpoise diameter.	0* to 500 ft (152 m).
Height above fss.	0* to 500 ft (152 m).
Polarization options.	Horizontal,* vertical, or circular.
Tracking.	Directional* or tracking.
Gain, receiving antenna (main beam).	0* to 60 dBi.
Transmitting antenna (main beam).	0* to 60 dBi.
Transmitting antenna location.	Aircraft or facility*.
Horizon obstacle distance from facility.	From 0.1 to 3 times smooth earth horizon distance (calculated*).
Elevation angle above horizontal at facility	< 12 deg (calculated*).
Height above msl.	0* to 15,000 ft-msl (4572 m-msl) and ≤ aircraft altitude.
Ionospheric scintillation options.	No scintillation* or specified by index group.
Rain attenuation options.	None* or computed using attenuation rate or rain zone.
Refractivity options.	
Effective earth's radius.	4010 to 6070 n mi (7427 to 11,242 km).
Or minimum monthly mean, N_o.	200 to 400 N-units (301 N-units*).
Surface reflection lobing options.	Contributes to variability* or determines median level.
Surface type options.	Poor, average* or good ground, fresh or sea water, concrete, metal.
Sea state.	0 to 9.
Or rms wave height, σ_h.	0 to 164 m (50 ft).
Temperature	0, 10,* or 20°C.
Terrain elevation above msl at facility.	0* to 15,000 ft-msl (4572 m-msl).
Parameter, Δh.	0* or greater.
Time availability options.	For instantaneous levels exceeded* or for hourly median levels exceeded.
Climates.	Continental all year* or seven others.
Or time blocks.	1 through 8, summer, winter.

*Values or options that will be assumed when specific designations are not made are flagged by asterisks.

(d) antenna patterns [16, Sec. 3.4; 21, Sec. 4],
(e) surface reflection multipath [6; 7; 14, p. 17; 15, Sec. A.6; 16, Sec. 3; 17, Sec. CI-D.7],
(f) tropospheric multipath [3; 14, Sec. 3.1; 15, Sec. A.7; 19; 23, pp. 60, 119, B-2],
(g) atmospheric absorption [15, Sec. A.4.5; 33, Fig. 3.1],
(h) ionospheric scintillations [1; 14, Sec. 2.5; 16, Sec. 4.5; 17, Sec. CVII; 31; 37], and
(i) rain attenuation [9, 27, 35].

The model is an extended version of the model previously described in detail by Gierhart and Johnson [15, Sec. A]. These extensions include provisions for

(a) sea state [16, Sec. 3.1],
(b) a divergence factor [16, Sec. 3.2; 34],
(c) a ray length factor for situations where the free-space loss associated with a surface reflected ray may be significantly greater than that associated with the direct ray [16, Sec. 3.3],
(d) an antenna pattern at each terminal [16, Sec. 3.4],
(e) circular polarization [16, Sec. 3.5],
(f) frequency and temperature variations or the complex dielectric constant of water [16, Sec. 3.5],
(g) long-term power fading as a function of radio climatic region [16, Sec. 4.3; 28, Sec. 4.4.25] or time block [16, Sec. 4.2],
(h) rain attenuation [16, Sec. 4.4],
(i) ionospheric scintillation [16, Sec. 4.5],
(j) an improved method for calculating the transmission loss associated with tropospheric scatter [16, Sec. 5],
(k) an aircraft antenna pattern [16, Sec. 10.1],

(l) ray elevation angle adjustment factors to allow for ray tracing [16, Sec. 10.2],

(m) antenna tracking options [16, Sec. 10.3],

(n) an improved estimate of the distance, (d_0), where horizon effects can be neglected [16, Sec. 7],

(o) a free-space loss formulation that is applicable to very high antennas [16, Sec. 8], and

(p) a formulation for facility horizon determinations that includes ray tracing [16, Sec. 9.2].

4. COMPARISON OF DATA WITH PREDICTIONS

Many comparisons of data with predictions made by the IF-77 and other models are provided in this section. These are blocked by data sources; i.e., DOT Report FAA-RD-75-165,I data, the Mid-west Program on Airborne Television Instruction (MPATI) data, DOC Report OT/TRER 16 data, and Radio Spectrum Measurement System (RSMS) data. Information on extent of data used from the various sources was provided in Table 1 (Sec. 2); i.e., number of paths and hours. Figures are grouped at the end of each section by increasing path number. These figures provide path parameter information and the comparison of data with predictions.

The parameter sheets are those used with the aeronautical data pool described in Appendix A, where a detailed discussion of the parameter sheet is included (Sec. A.1). Metric units are used exclusively on the parameter sheets, but English equivalents can easily be obtained by using values from the conversion factor chart provided in the front of this report. Parameter values are those given in the data source or are estimates (thought to be reasonable) made as part of the prediction process. Parameter values are flagged when they are not taken directly from the data source with, perhaps, a simple unit conversion.

Other information such as path profiles is included when it is available in the data source. Profiles are presented as they were provided in the data source. Units or scales were not modified.

Comparisons with data follow the path descriptive information and are shown, in most cases, as curves added to figures taken directly from the data source. Units and scales associated with the data source figures were not modified so that English units are sometimes used. Metric equivalent values or scales are not shown on these figures but are given on the parameter sheets. Other metric values can easily be obtained by using conversion factors from the chart provided in the front of this report.

4.1 FAA-RD-75-165,I DATA

Predictions made with the IF-77 and Free Space models (Table 2) are compared with data from the Department of Transportation (DOT) report FAA-RD-75-165,I [12] in this section. These data were collected with a receiver on board FAA Flight Inspection Aircraft N-67 in the vicinity of Chickasha, Oklahoma. The data used for comparison with predictions were recorded for approximately 20 hours on 28 paths.

Parameters for the Very High Frequency Omni Range (VOR) and Instrument Landing System (ILS) localizer (LOC) transmitters involved are summarized in Figures 1 and 2, respectively. These parameters were estimated from information given in the report [12, Fig. 2 and 5]. Parameters for the various paths are similar except for path number, path code, aircraft altitude, and station separation when it is applicable (Figs. 19 through 30). These parameters are summarized in Table 5. All predictions provided in this section were made using the variability option so that ground reflection multipath is included in the predicted variability, and lobing associated with the ground reflection is not allowed to influence the predicted median level inside the horizon lobe (Table 4). Predictions for Figures 3 through 18 were made with program ATOA, while those for Figures 19 through 30 were made with program ADUDD [21, Table 1]. Figures 3 through 10 are for VOR transmissions, and Figures 11 through 18 are for LOC transmissions where the data are receiver input in microvolts

Table 5. Additional Section 4.1 Parameters

Figure	Path Number	Code Number (see Sec. A.1)	Station Type	Aircraft Altitude Meters above Ground[a]	
			Signal Strength		
3	40001	0221 0105 7220 2811	VOR	152.4	
4	40002	0221 0105 7220 2811	VOR	304.8	
5	40003	0221 0105 7220 2811	VOR	609.6	
6	40004	0221 0105 7220 2811	VOR	914.4	
7	40005	0221 0105 7220 2811	VOR	1219	
8	40006	0221 0105 7220 2811	VOR	1524	
9	40007	0221 0105 7220 2811	VOR	3048	
10	40008	0221 0105 7220 2811	VOR	4572	
11	40009	0221 0105 7120 2811	LOC	152.4	
12	40010	0221 0105 7120 2811	LOC	304.8	
13	40011	0221 0105 7120 2811	LOC	609.6	
14	40012	0221 0105 7120 2811	LOC	914.4	
15	40013	0221 0105 7120 2811	LOC	1219	
16	40014	0221 0105 7120 2811	LOC	1524	
17	40015	0221 0105 7120 2811	LOC	3048	
18	40016	0221 0105 7120 2811	LOC	4572	
			Desired/Undesired		**Station Separation Kilometers[b]**
19	40017	1221 0105 7020 2811	VOR/LOC	304.8	74
20	40018	1221 0105 7020 2811	VOR/LOC	609.6	74
21	40019	1221 0105 7020 2811	VOR/LOC	914.4	74
22	40020	1221 0105 7020 2811	VOR/LOC	1219	74
23	40021	1221 0105 7020 2811	VOR/LOC	3048	74
24	40022	1221 0105 7020 2811	VOR/LOC	4572	74
25	40023	1221 0105 7020 2811	VOR/LOC	152.4	46
26	40024	1221 0105 7020 2811	VOR/LOC	304.8	46
27	40025	1221 0105 7020 2811	VOR/LOC	609.6	46
28	40026	1221 0105 7020 2811	VOR/LOC	914.4	46
29	40027	1221 0105 7020 2311	VOR/LOC	1219	46
30	40028	1221 0105 7020 2811	VOR/LOC	1524	46

[a] Converted with four significant figures from values given in feet on the figures.

[b] Converted with two significant figures from values given in nautical miles on the figures.

(1 μV across 50 Ω = -137 dBW) versus aircraft-to-station distance in nautical miles (1 Nm = 1.852 km). Desired (VOR) to undesired (LOC) signal ratios (D/U) versus distance from the undesired facility data are given in Figures 19 through 30.

Because of the nominal nature of the parameters used for the predictions, which include an assumed isotropic aircraft antenna, comparisons between measured and predicted values are provided only by the addition of predicted curves to the copies of graphs from FAA-RD-75-165,I [12] that show the measured data; i.e., statistical comparisons were not developed.

A better comparison between predicted and measured data would have been possible if each flight had been repeated several times. Additional data for each flight path would give an indication of the variability.

Some observations concerning these comparisons are as follows:

(1) The facility antenna patterns used in the predictions have a null (-18 dB) for elevation angles near 90° [21, Fig. 45, cosine pattern]. This null can be seen in the IF-77 and Free Space predictions at zero distance (e.g., Fig. 9). While the actual facility antenna would be expected to have a similar characteristic, it is probably masked by experimental conditions such as time constants associated with the recording instrumentation, aircraft location uncertainty and aircraft antenna gain.

(2) The variability mode was used in the IF-77 predictions. This causes the variability to increase in the region where terrain reflection lobing would be present and neglects such lobing in the median level. Lobing caused by counterpoise reflection is included in the median only. Figure 9 illustrates these characteristics. Also note that data for the terrain reflection exceeds

the free space level by more than the maximum theoretical amount (6 dB) for a single reflection. Aircraft antenna gain is probably responsible for this since 0 dB gain was assumed in the predictions. A signal level lower by an average of 5.5 dB on from facility flights was observed, and only those data for to facility flights were plotted in FAA-RD-75-165,I [12, p. 4].

(3) Agreement between data and predictions seems to decrease with increasing altitude (e.g., Figs. 3 through 10). This is because the variability mode does not show terrain reflection lobing in the median level, and the data clearly show such lobing (Fig. 9).

(4) For a fixed aircraft location relative to an undesired station, an increase in D/U would be expected if the facility separation is reduced because the distance to the desired facility would be less. Both the data and predictions follow this expectation in that D/U's for the 40 Nm facility separation set (Figs. 19 through 24) are less than those for the 25 Nm separation set (Figs. 25 through 30).

(5) For fixed facility separation, fixed aircraft to undesired facility distance, and the aircraft near the undesired facility, an increase in D/U would be expected as aircraft altitude increases since an improvement in terrain clearance for the desired facility to aircraft path would usually increase the desired signal level. Both the data and predictions usually follow this expectation [Figs. 19 through 30].

(6) The comparisons provided in this section indicate that the IF-77 model provides better predictions than the Free Space model even when line-of-sight conditions prevail.

Path Number: _ _ _ 4 0 0 0 1 to 4 0 0 0 8
4 0 0 1 7 to 4 0 0 2 8

Code Number: 0 2 2 1 0 1 0 5 0 1 2 0 2 8 1 1

Location: Near Chickasha, Oklahoma

Data type about 10 hours of instantaneous measurements Distance varies km, h_{rs} 0* m-msl

N_o 301* N-units, a ____ km, Surface type average ground

Climate continental temperate ____, d_e ____ km

Frequency 110.6 MHz, Transmitter output ____ dBW, EIRP 21.3 dBW

Δh 0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	4.88	
gain [dBi], main beam	2.15	0*
height [m], above site surface	4.88	
line loss [dB]	3.0	0*
polarization	H	H
type	Cosine pattern	Isotropic*
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	35°29'14"N	
longitude	97°59'21"W	
Path bearing		
elevation [m-msl]		

Other information:

Table 5 and figures cited there.

FAA-RD-75-165, I, p. 1 to 4 and A-1 to A-11.

*A smooth effective earth with a "4/3" radius was assumed along with an isotropic aircraft antenna. Data for elevations "above ground" should be compared with predictions for the same elevation above msl. A portable VOR (on a truck) with a counterpoise was estimated to be 3.66 m in diameter and 3.66 m above ground. The VOR was first placed 40 n mi directly north of Chickasha, Oklahoma, at Okarche, Oklahoma, and later moved to El Reno, Oklahoma, 25 n mi directly north of Chickasha.

Figure 1. Paths 40001 through 40008 and 40017 through 40028, parameters, VOR.

Path Number: ___ ___ ___ 4 0 0 0 9 to 4 0 0 2 8

Code Number: 0 2 2 1 0 1 0 5 0 1 2 0 2 8 1 1

Location: Near Chickasha, Oklahoma

Data type about 10 hours of instantaneous measurements, Distance varies km, h_{rs} 0* m-msl

N_o 301* N-units, a ______ km, Surface type average ground

Climate continental temperate, d_e ______ km

Frequency 110.5 MHz, Transmitter output ______ dBW, EIRP 23.3 dBW

Δh 0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1.68	
gain [dBi], main beam	1.0	0*
height [m], above site surface	1.68	
line loss [dB]	0.0	0*
polarization	H	H
type	Cosine pattern	Isotropic*
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	35°09'19"N	
longitude	97°58'09"W	
Path bearing		
elevation [m-msl]		

Other information:

Table 5 and figures cited there.

FAA-RD-75-165, I, p. 1 to 4 and A-1 to A-11.

*A smooth effective earth with a "4/3" radius was assumed along with an isotropic aircraft antenna. Data for elevations "above ground" should be compared with predictions for the same elevation above msl.

Figure 2. Paths 40009 through 40028, parameters, LOC.

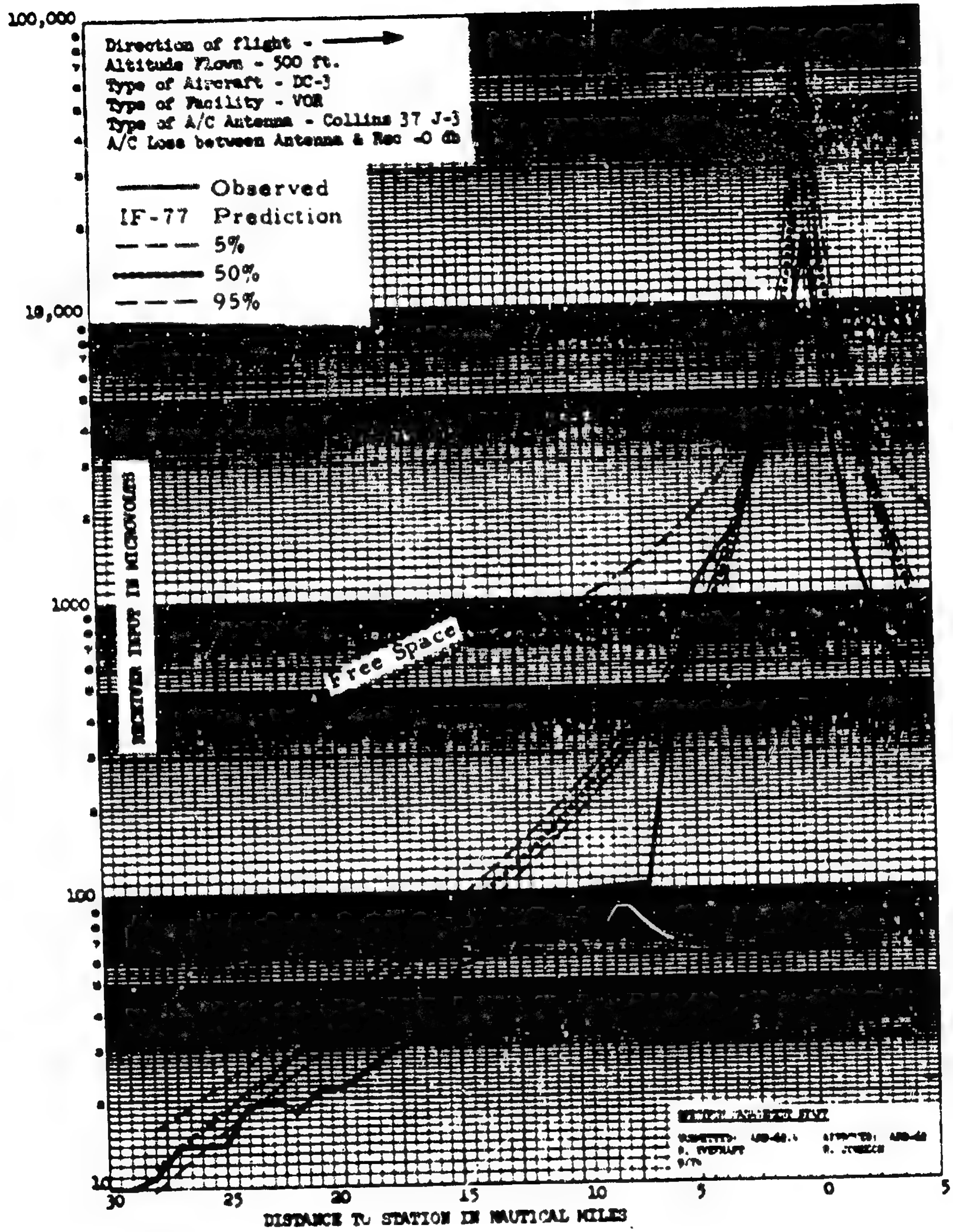


Figure 3. Path 40001, data [10, p. B-1].

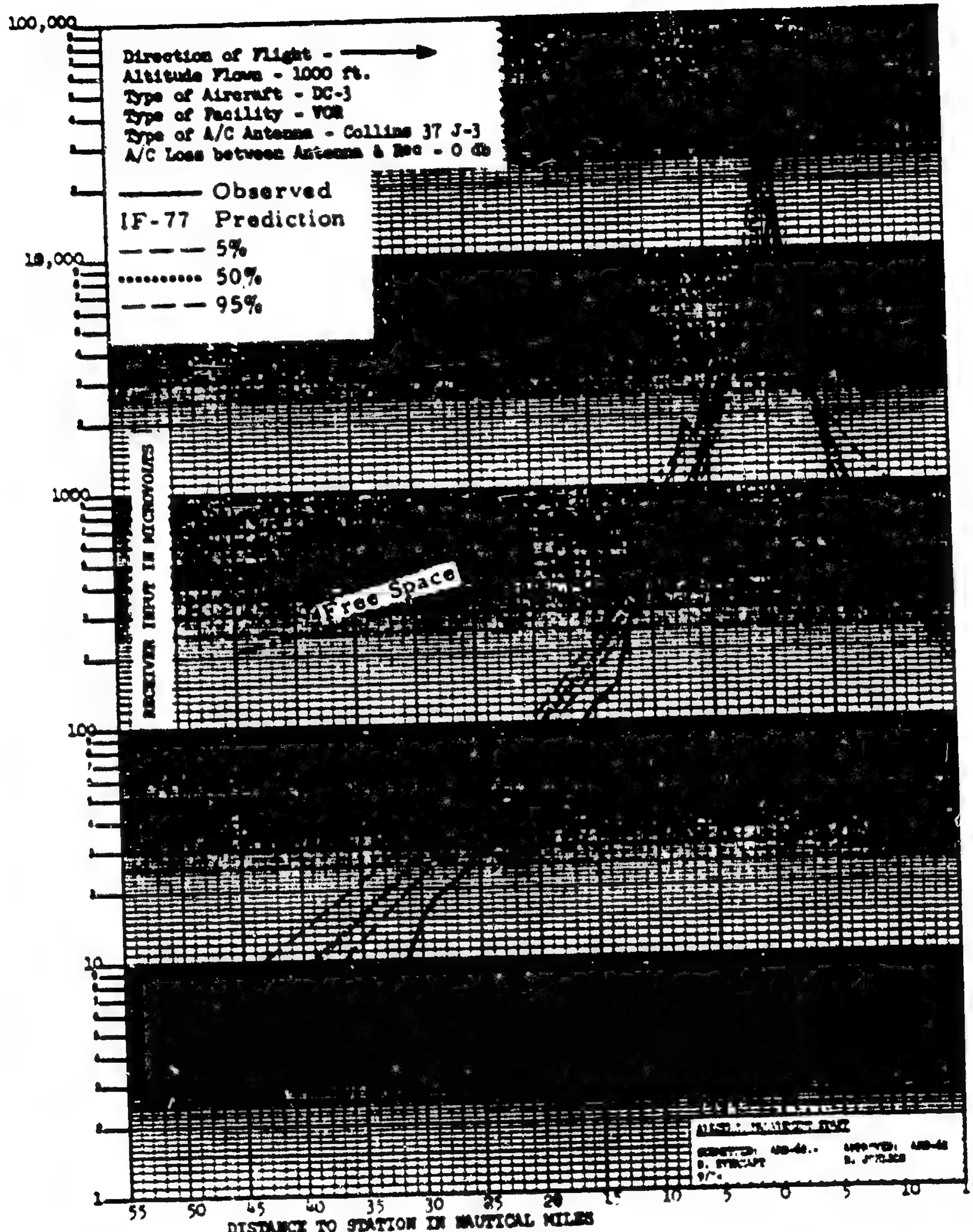


Figure 4. Path 40002, data [10, p. B-2].

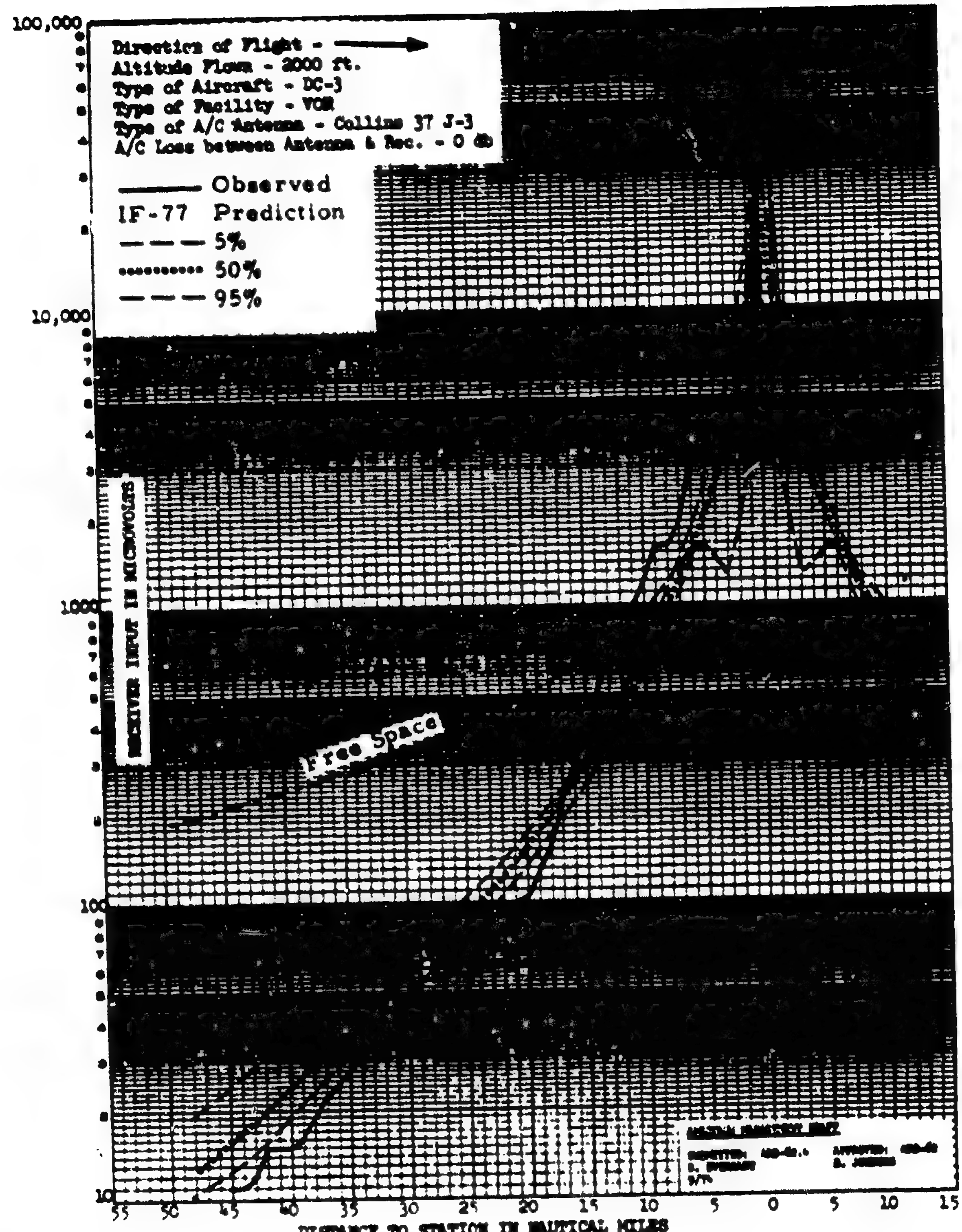


Figure 5. Path 40003, data [10, p. B-3].

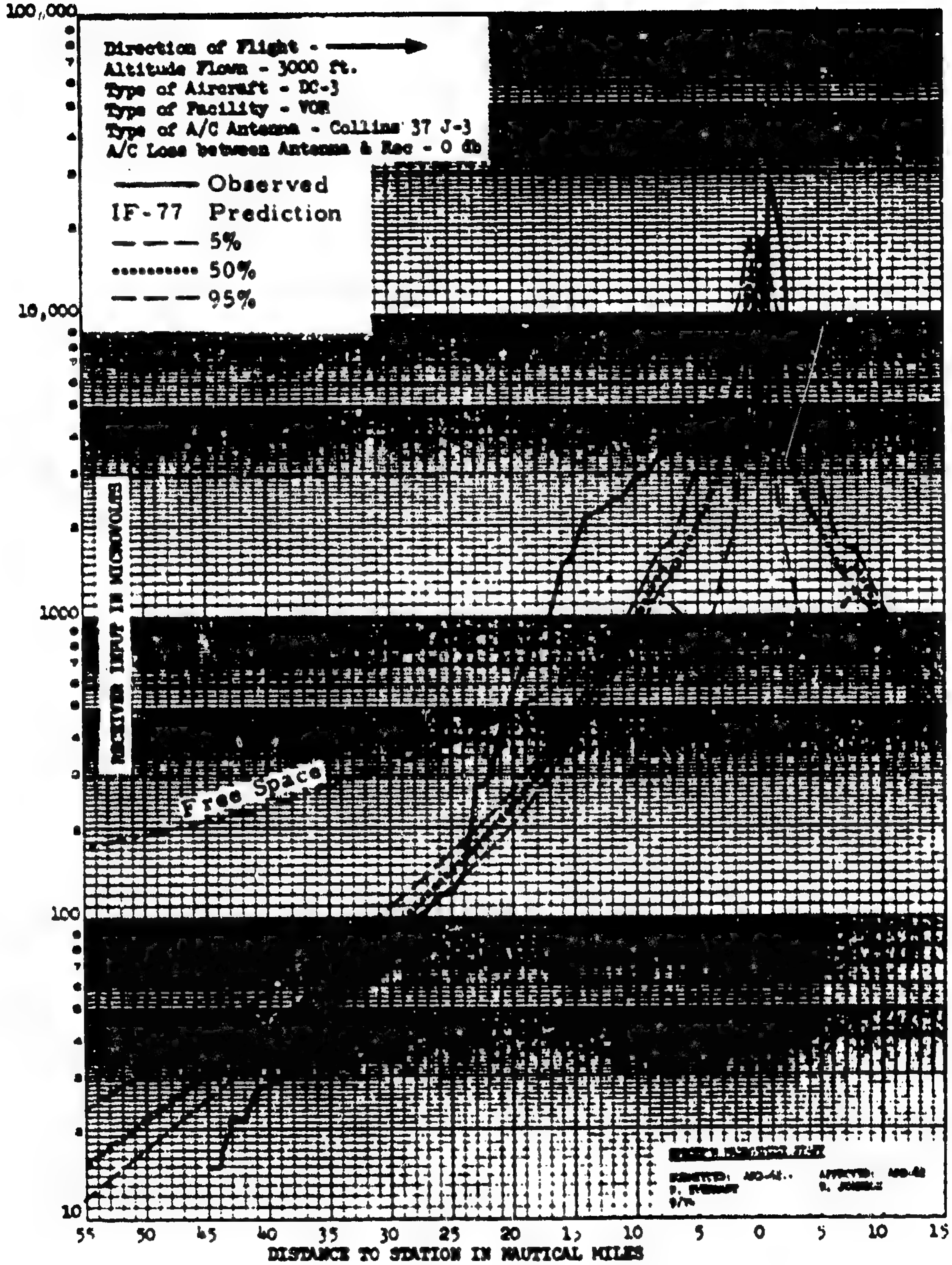


Figure 6. Path 40004, data [10, p. B-4].

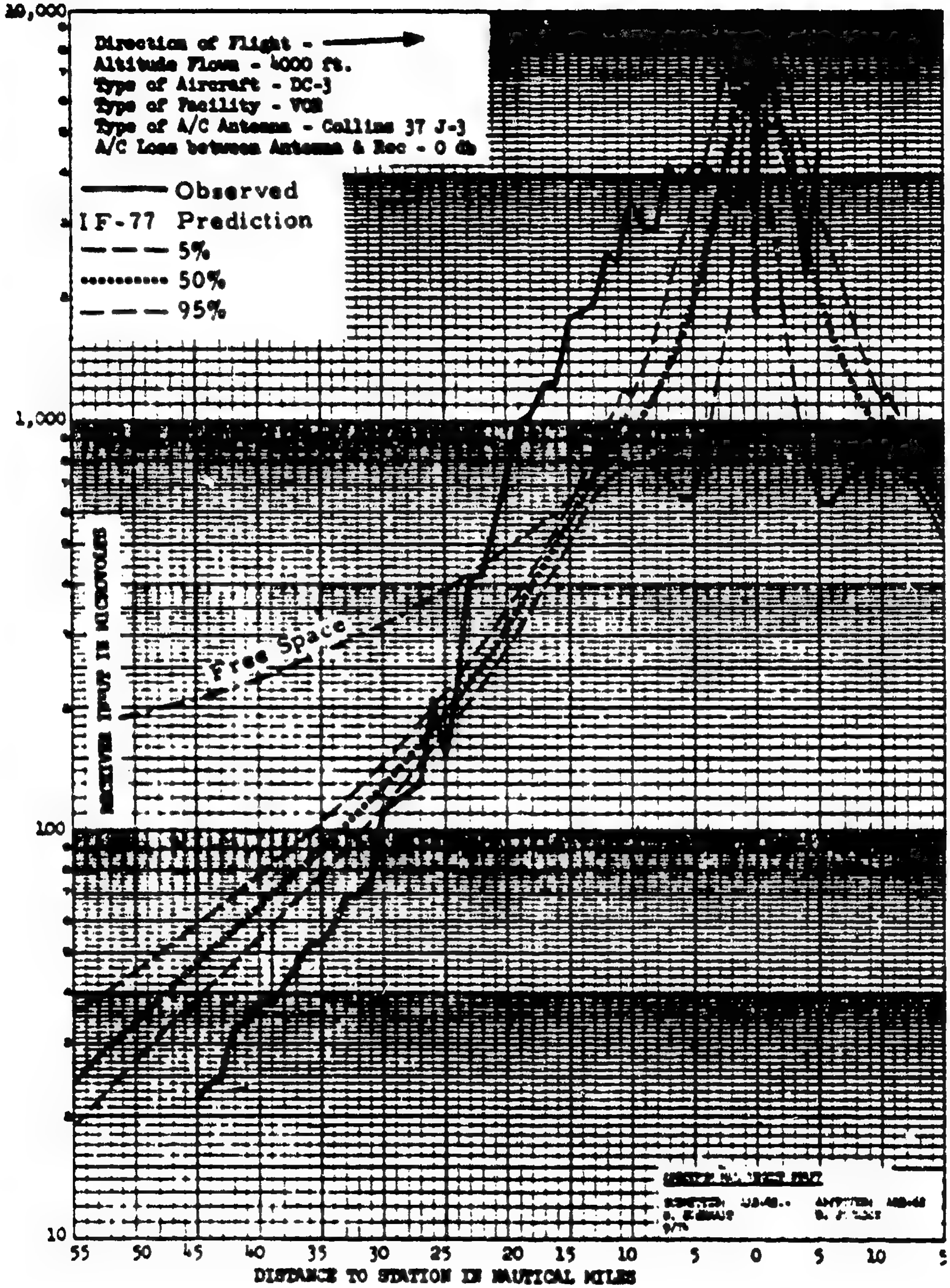


Figure 7. Path 40005, data [10, p. B-5].

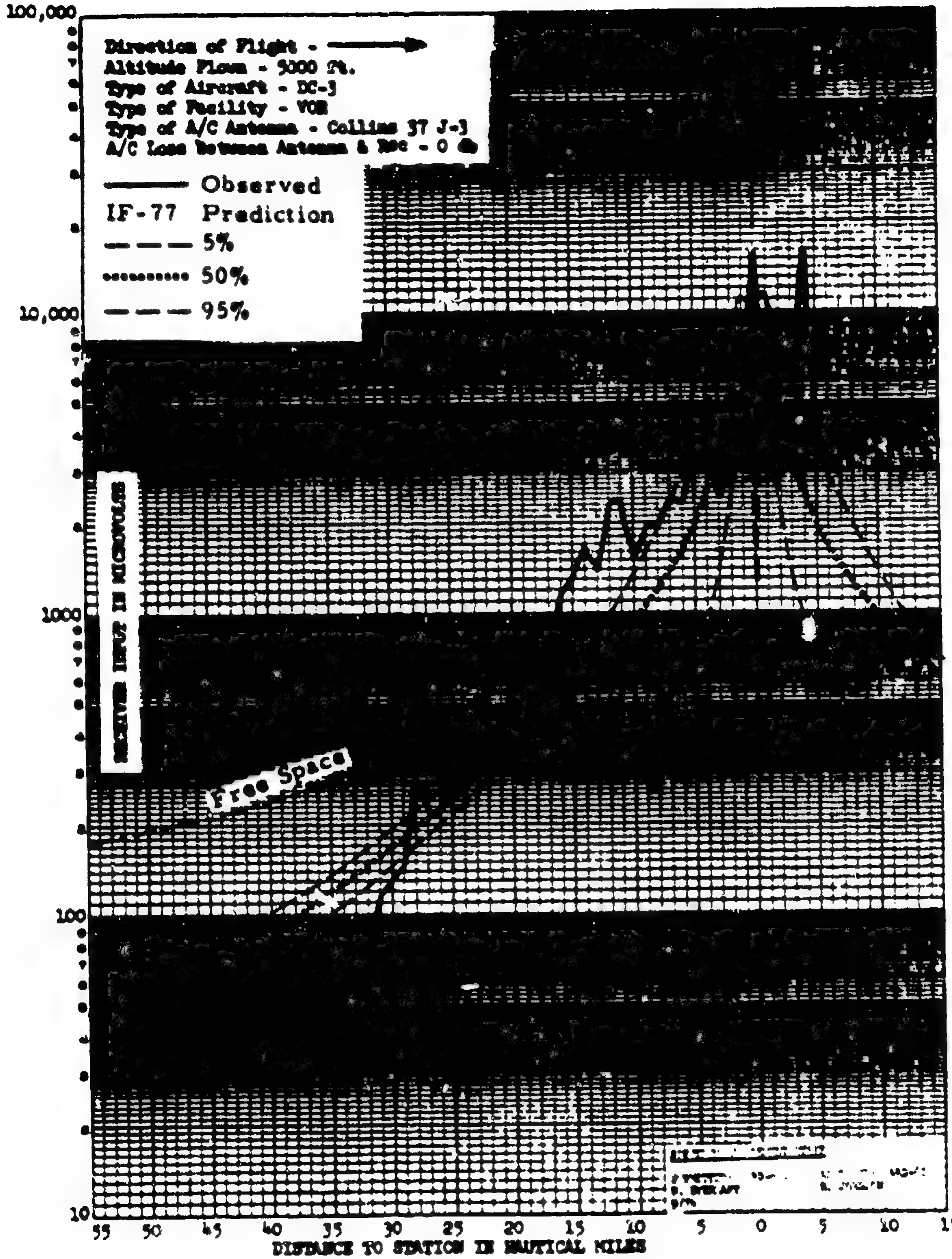


Figure 8. Path 40006, data [10, p. B-6].

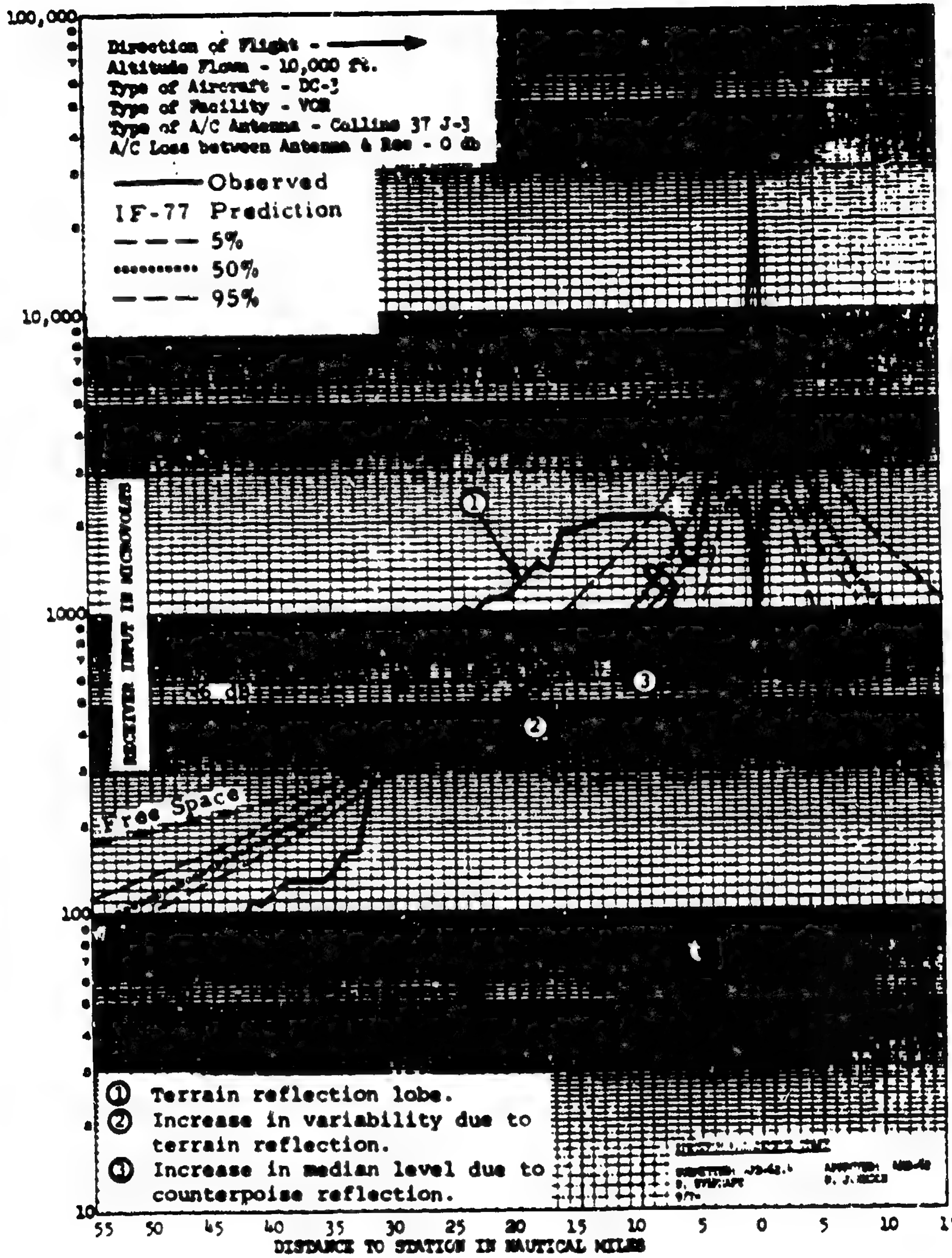


Figure 9. Path 40007, data [10, p. B-7].

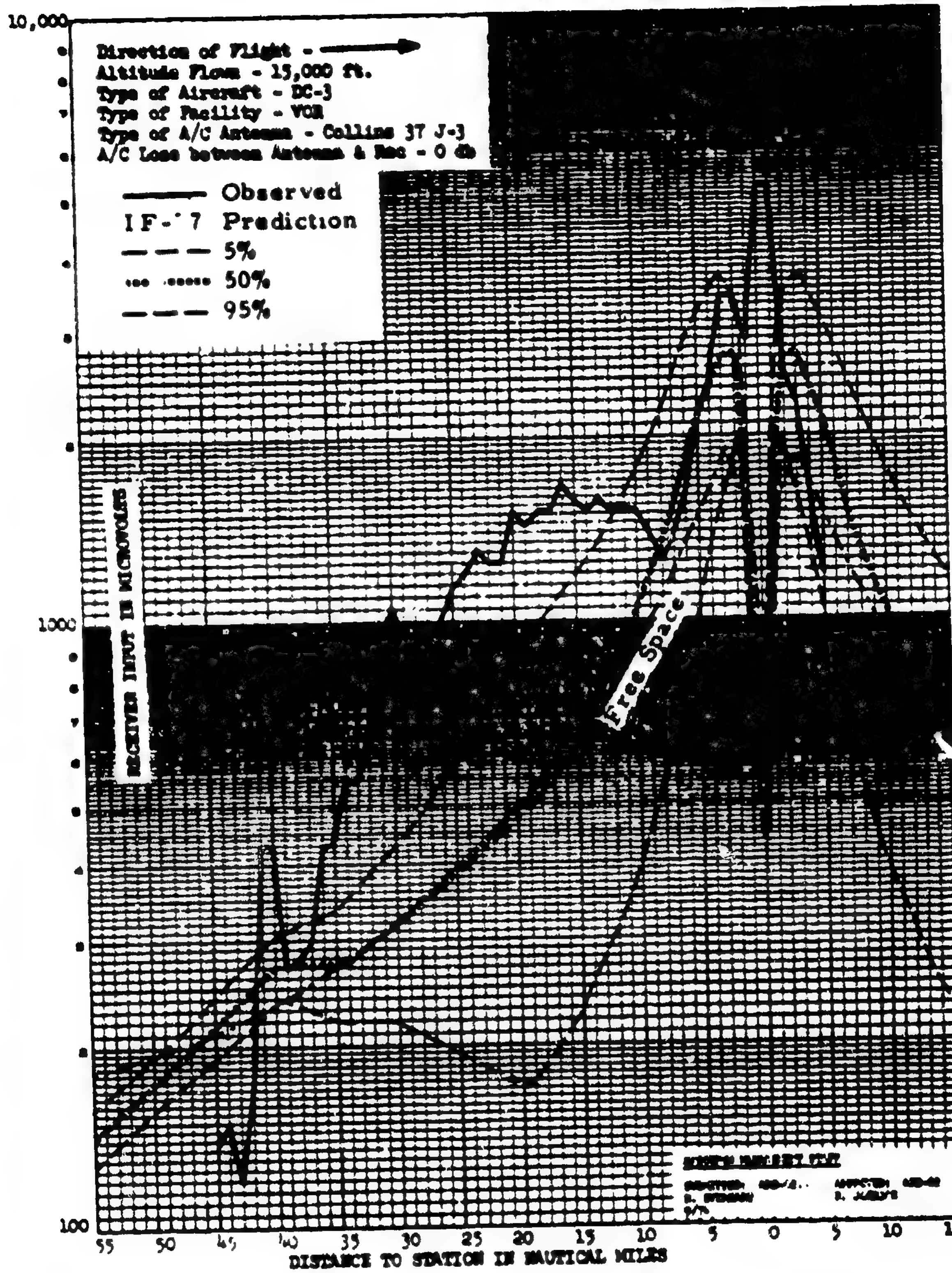


Figure 10. Path 40008, data [10, p. B-8].

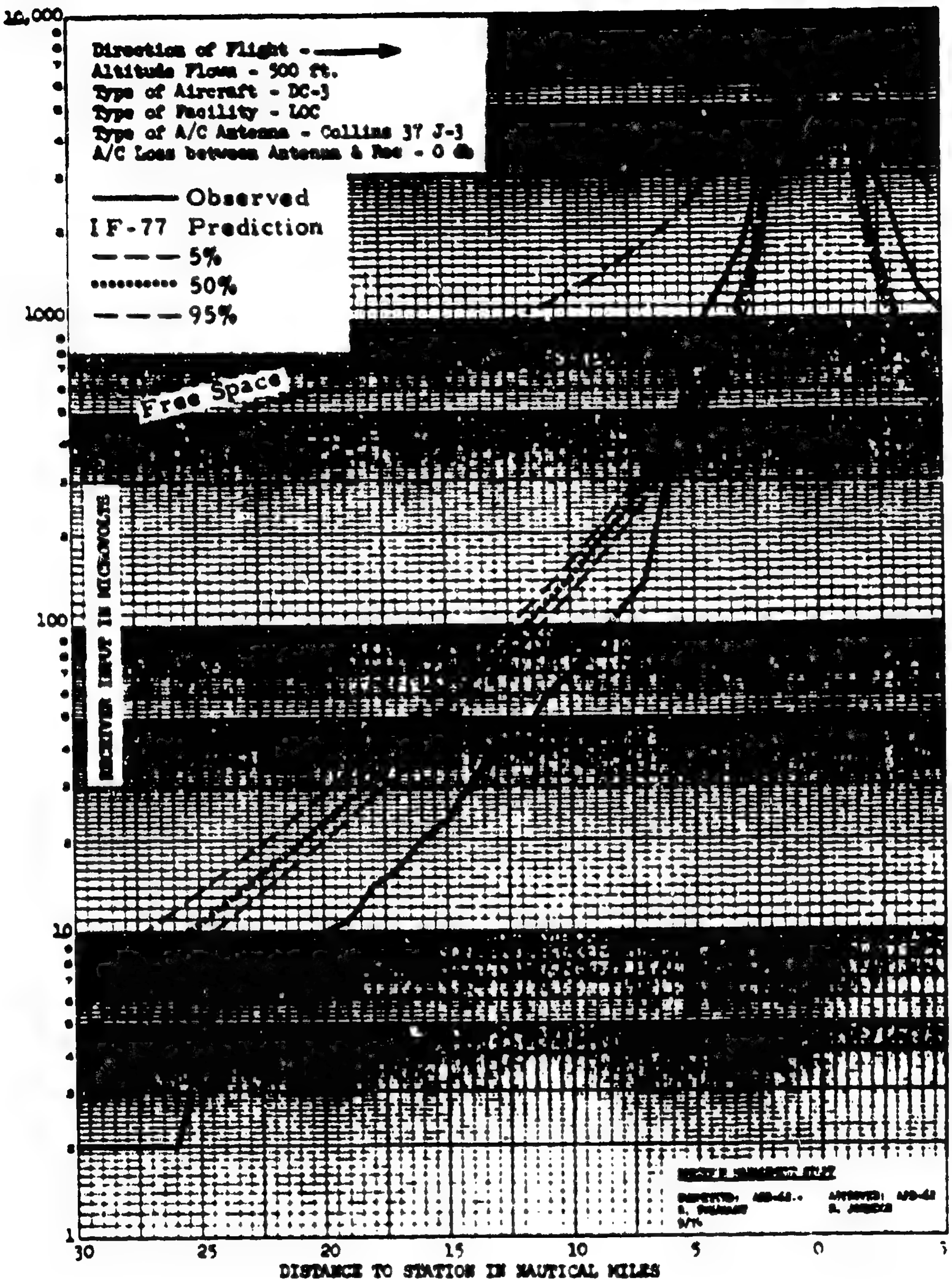


Figure 11. Path 40009, data [10, p. C-1].

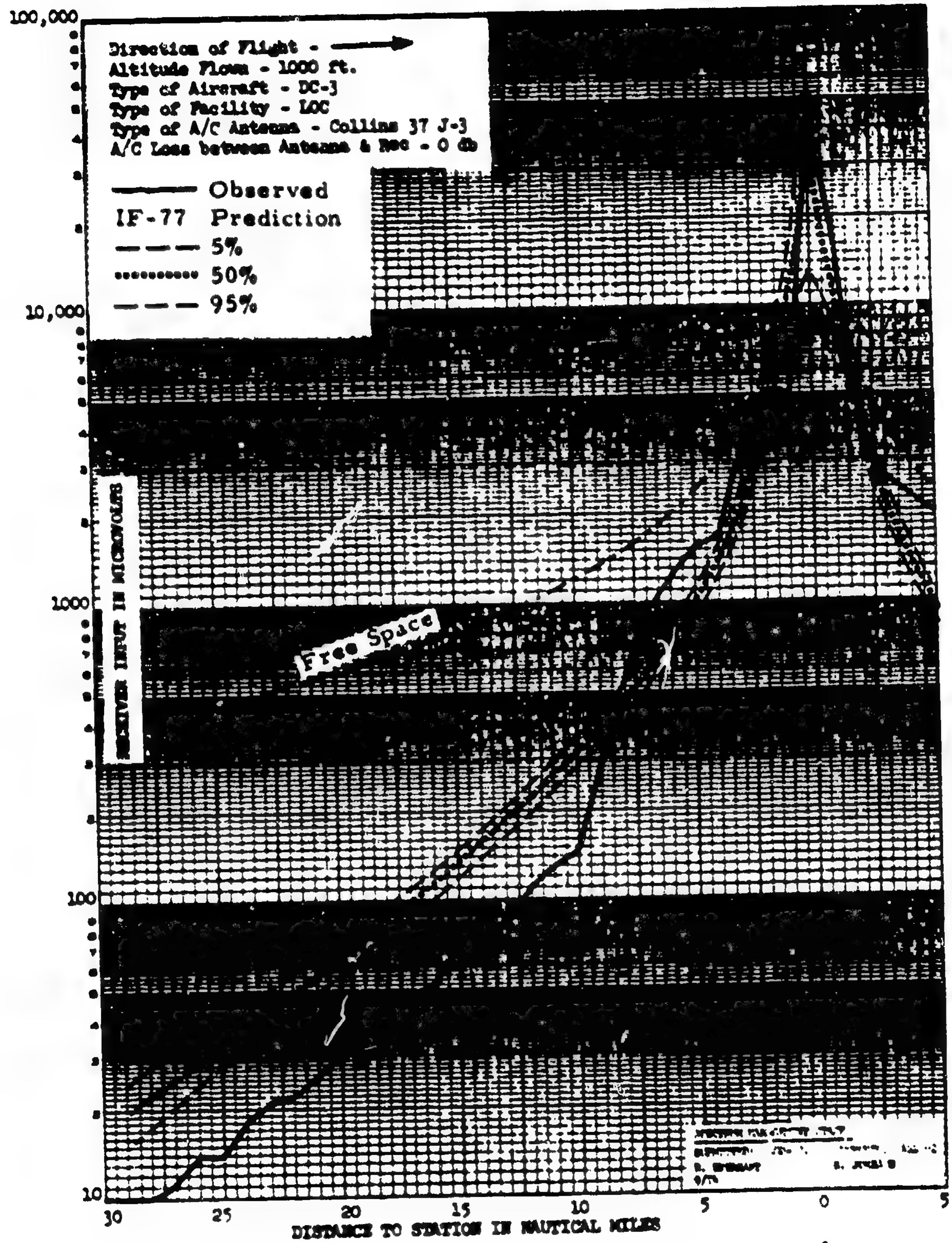


Figure 12. Path 40010, data [10, p. C-2].

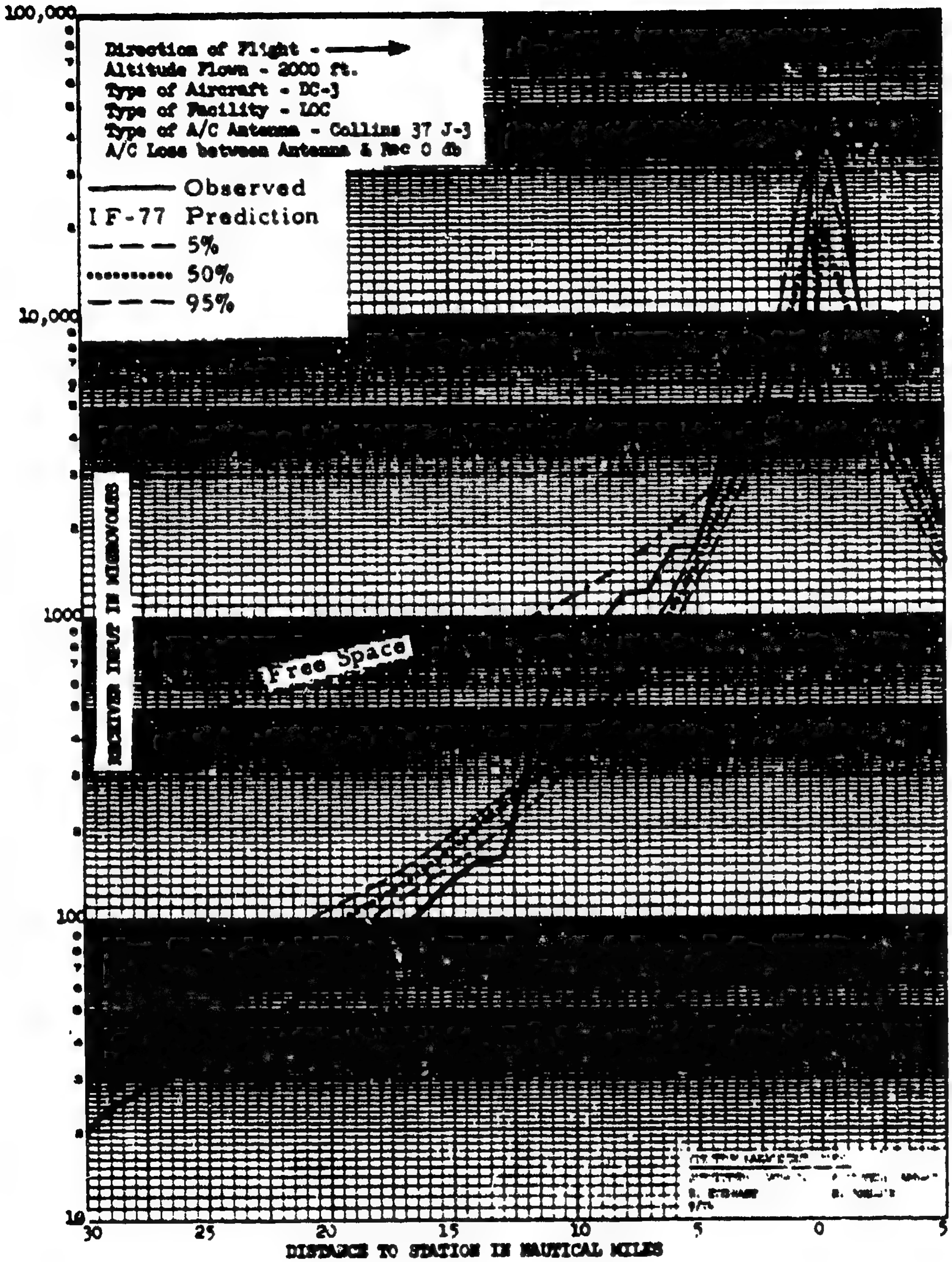


Figure 13. Path 40011, data [10, p. C-3].

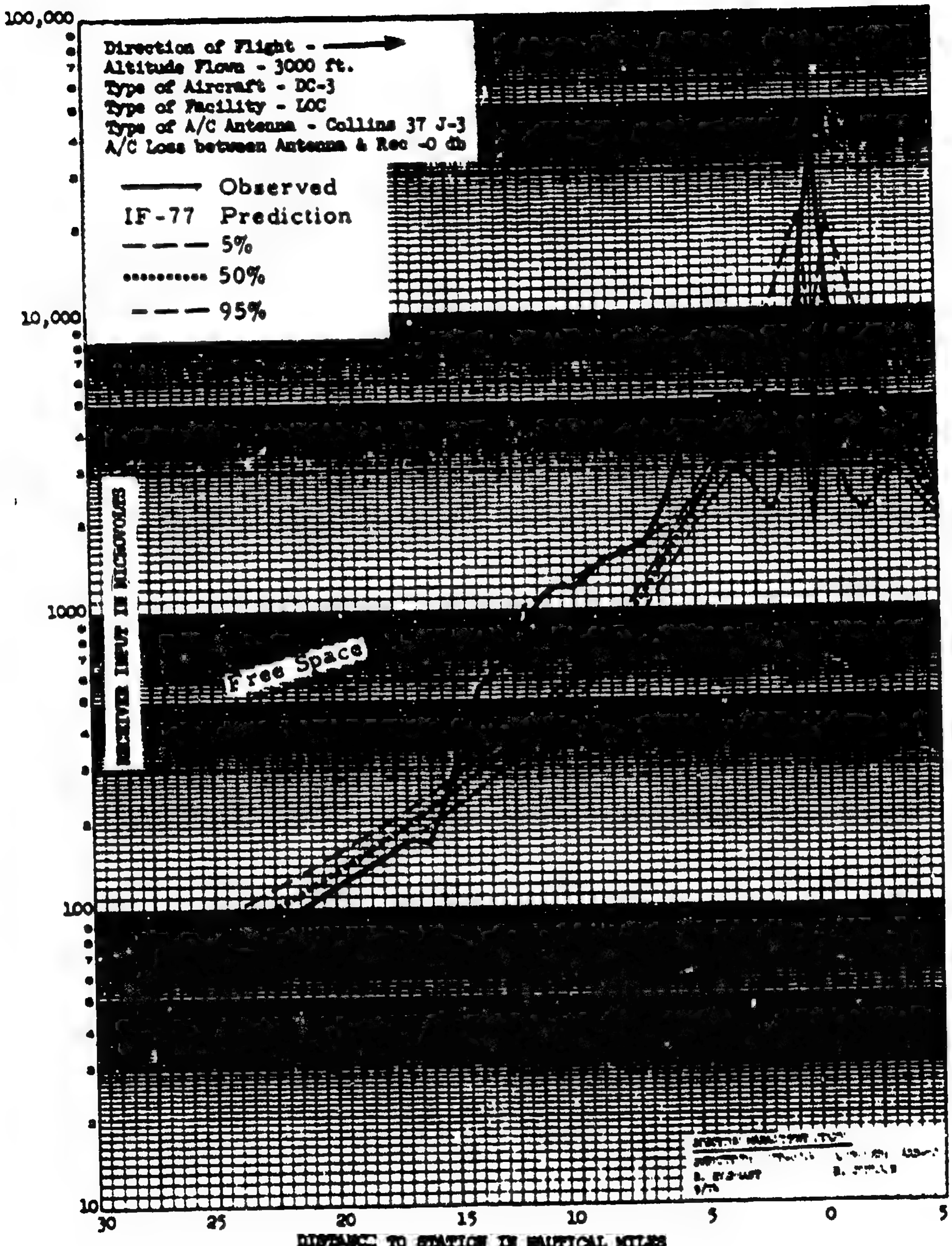


Figure 14. Path 40012, data [10, p. C-4].

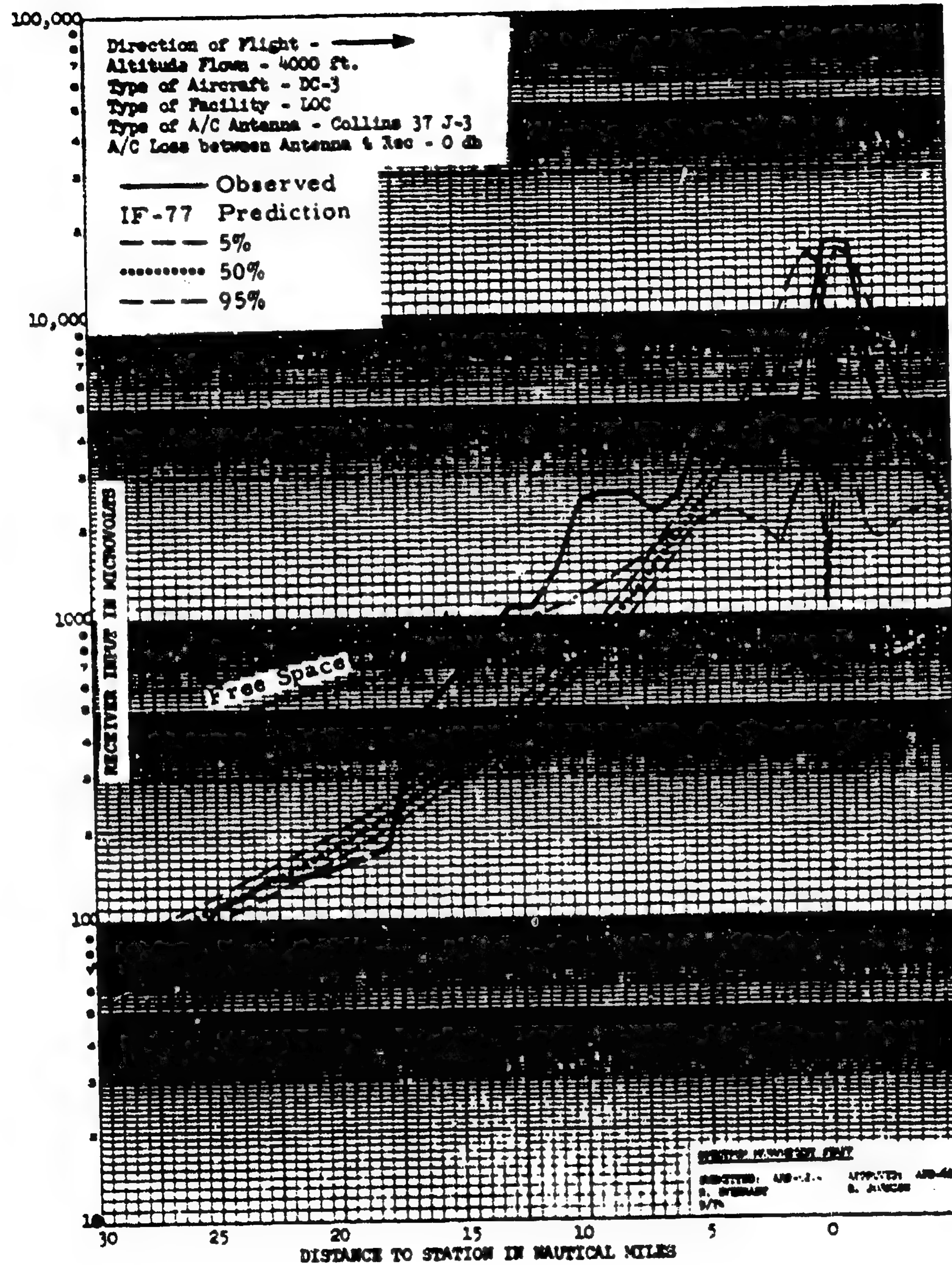


Figure 15. Path 40013, data [10, p. C-5].

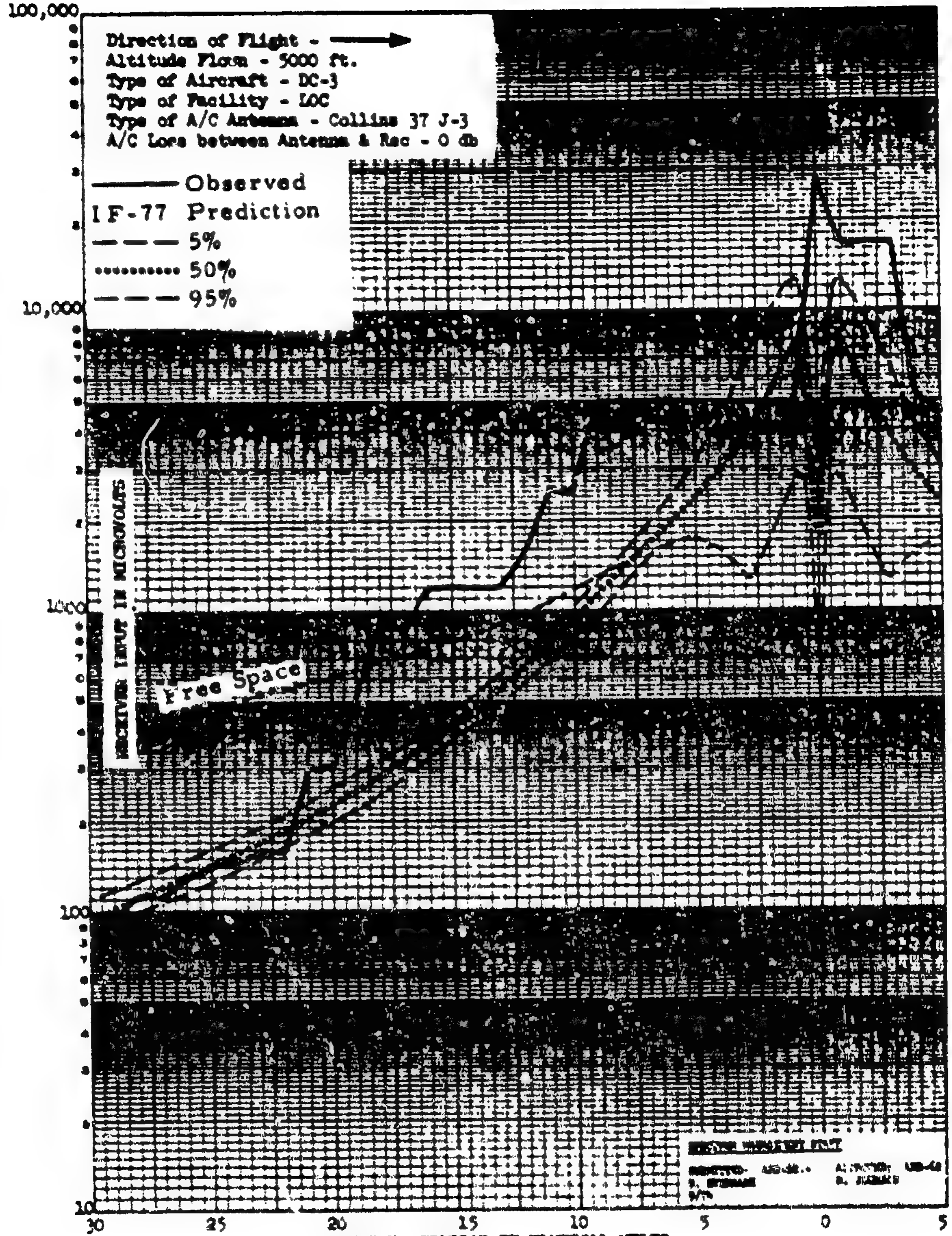


Figure 16. Path 40014, data [10, p. C-6].

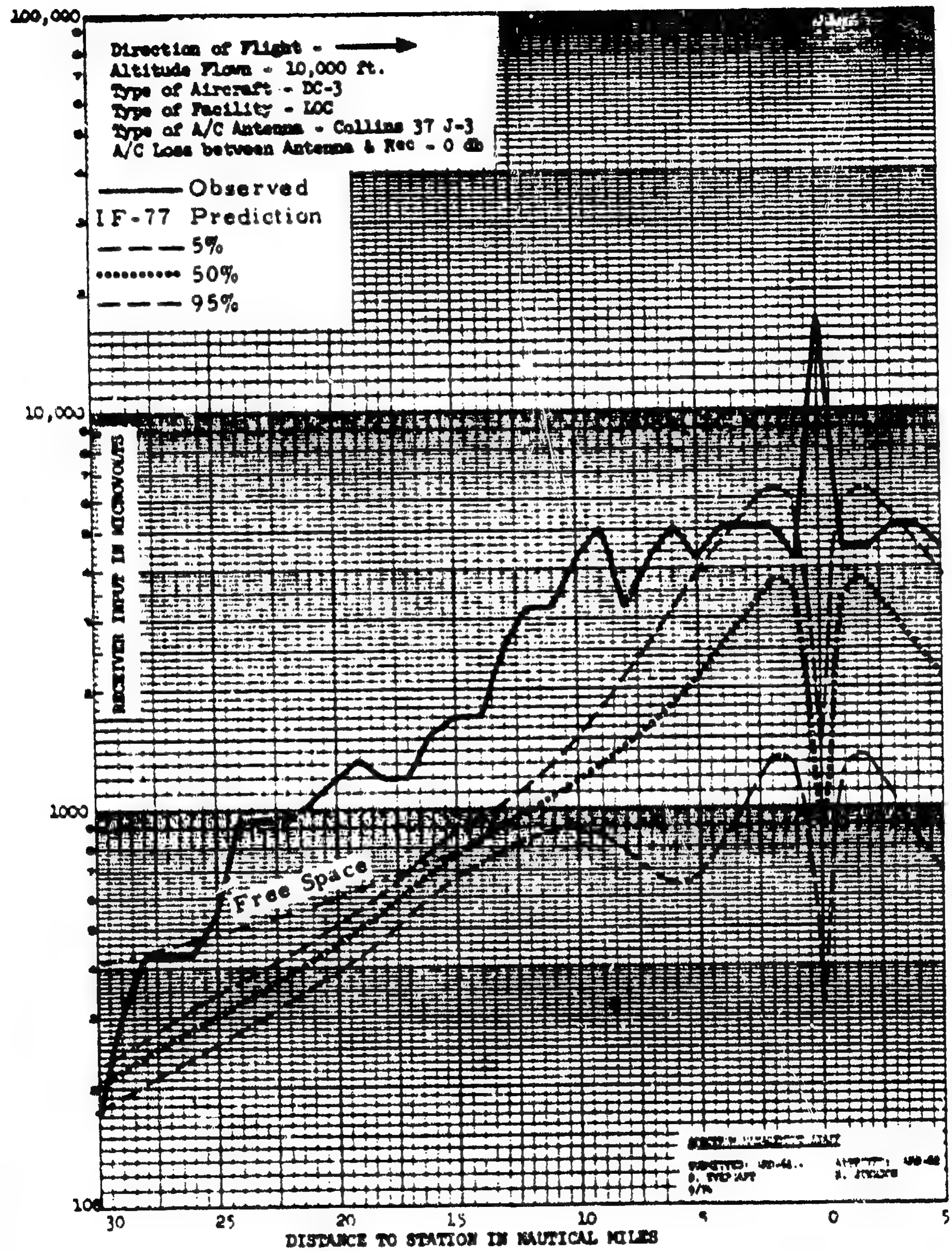


Figure 17. Path 40015, data [10, p. C-7].

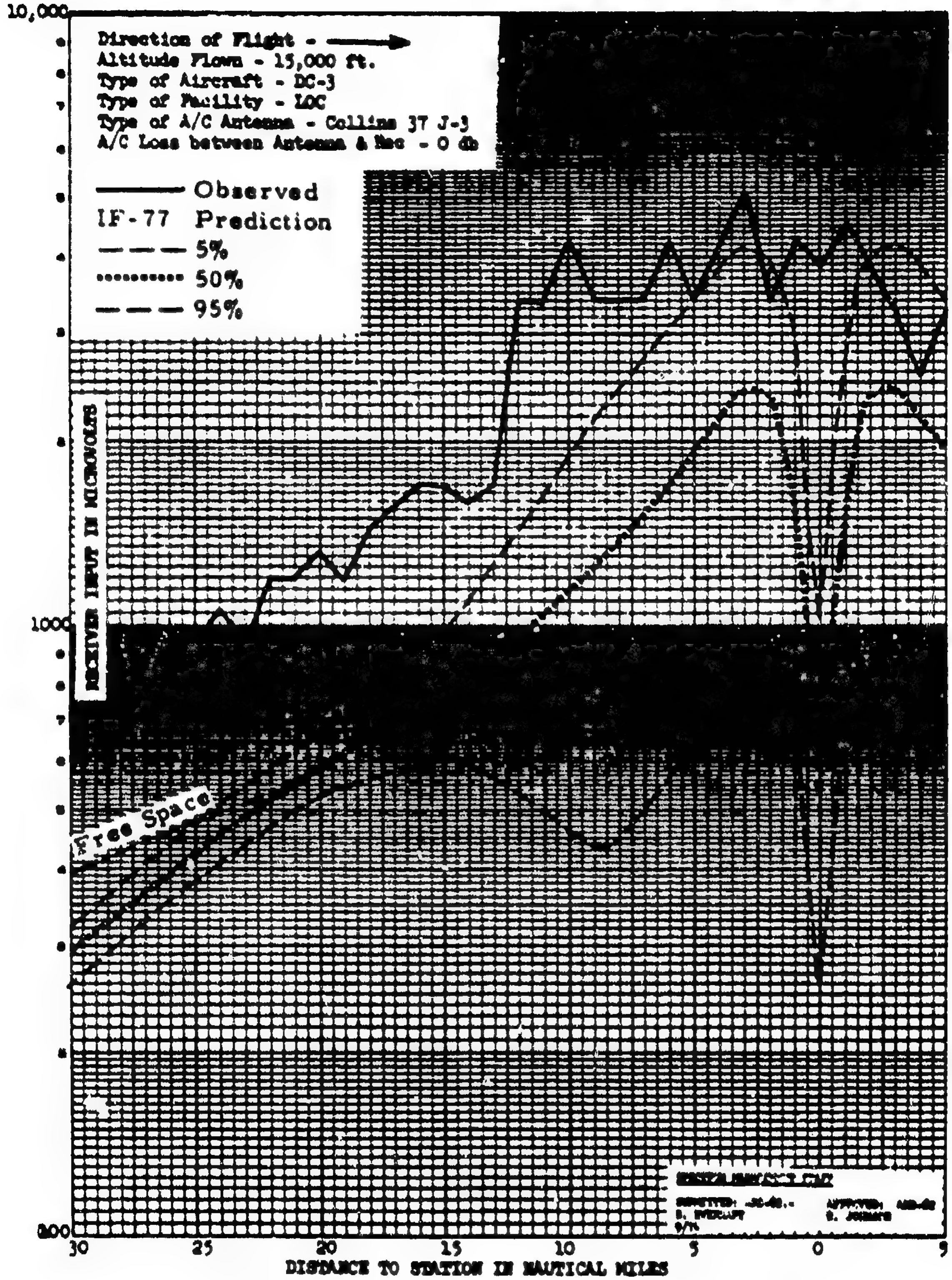


Figure 18. Path 40016, data [10, p. C-8].

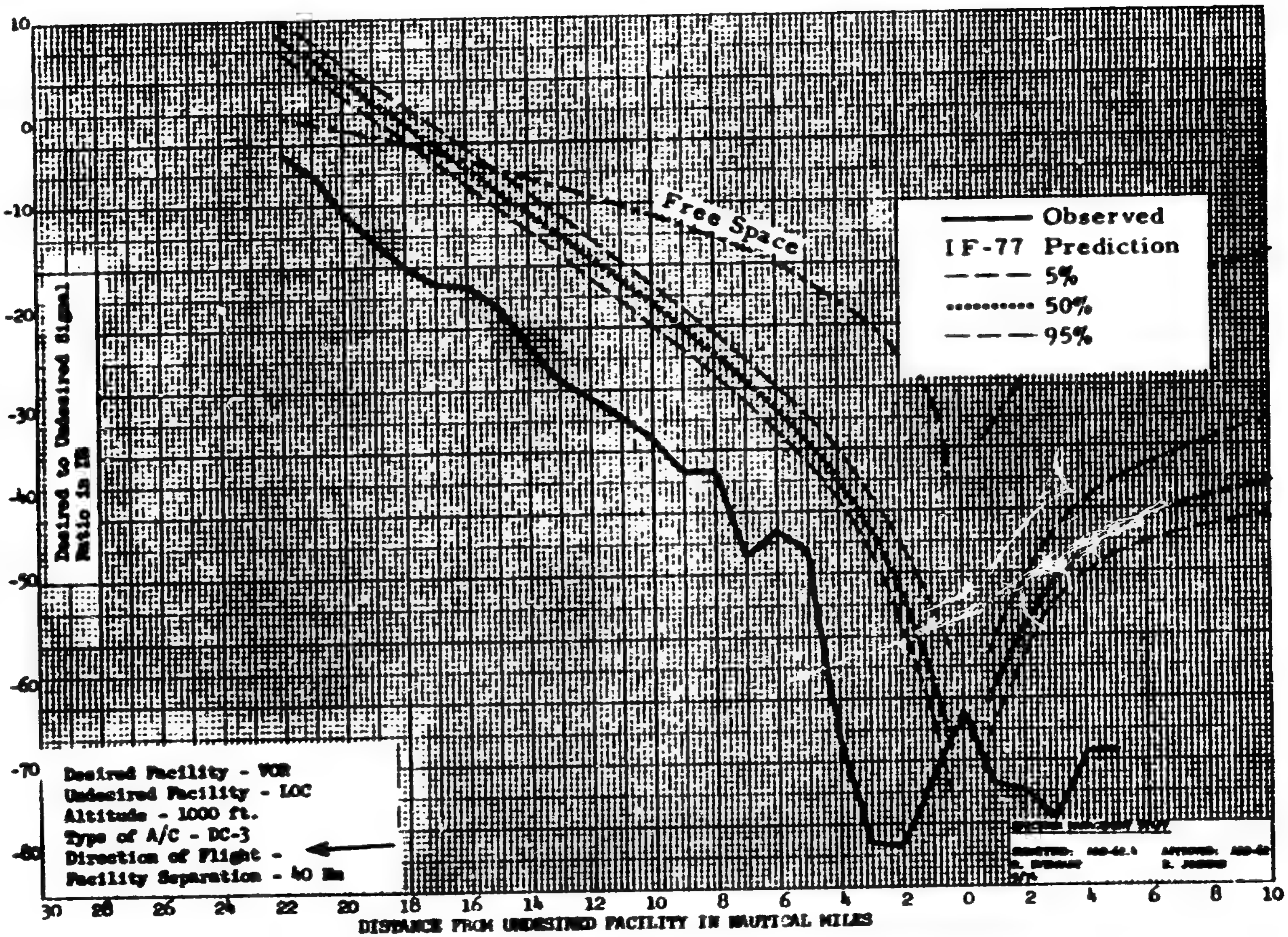


Figure 19. Path 40017, data [10, p. D-1].

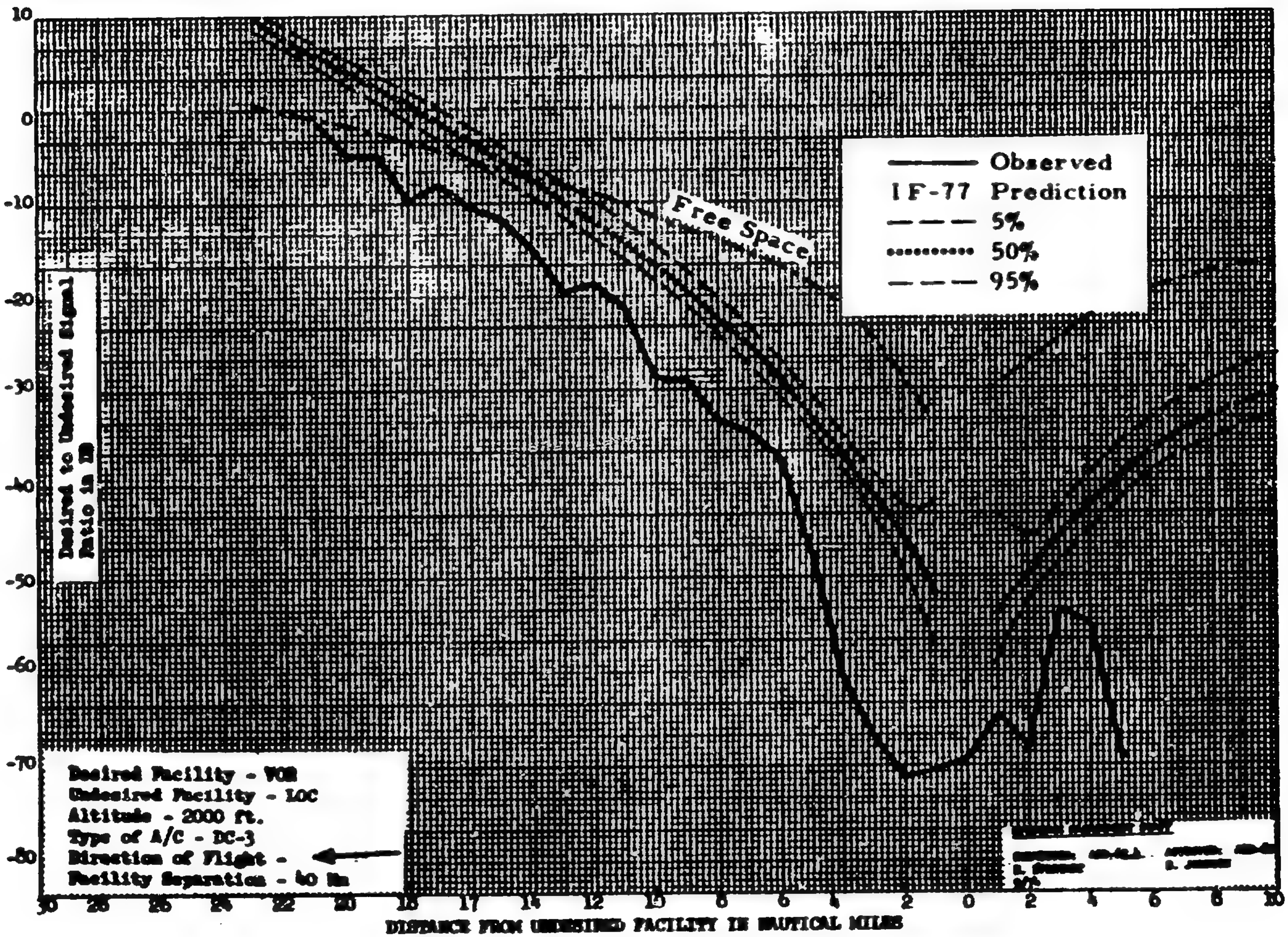


Figure 29. Path 49018, data [10, p. D-2].

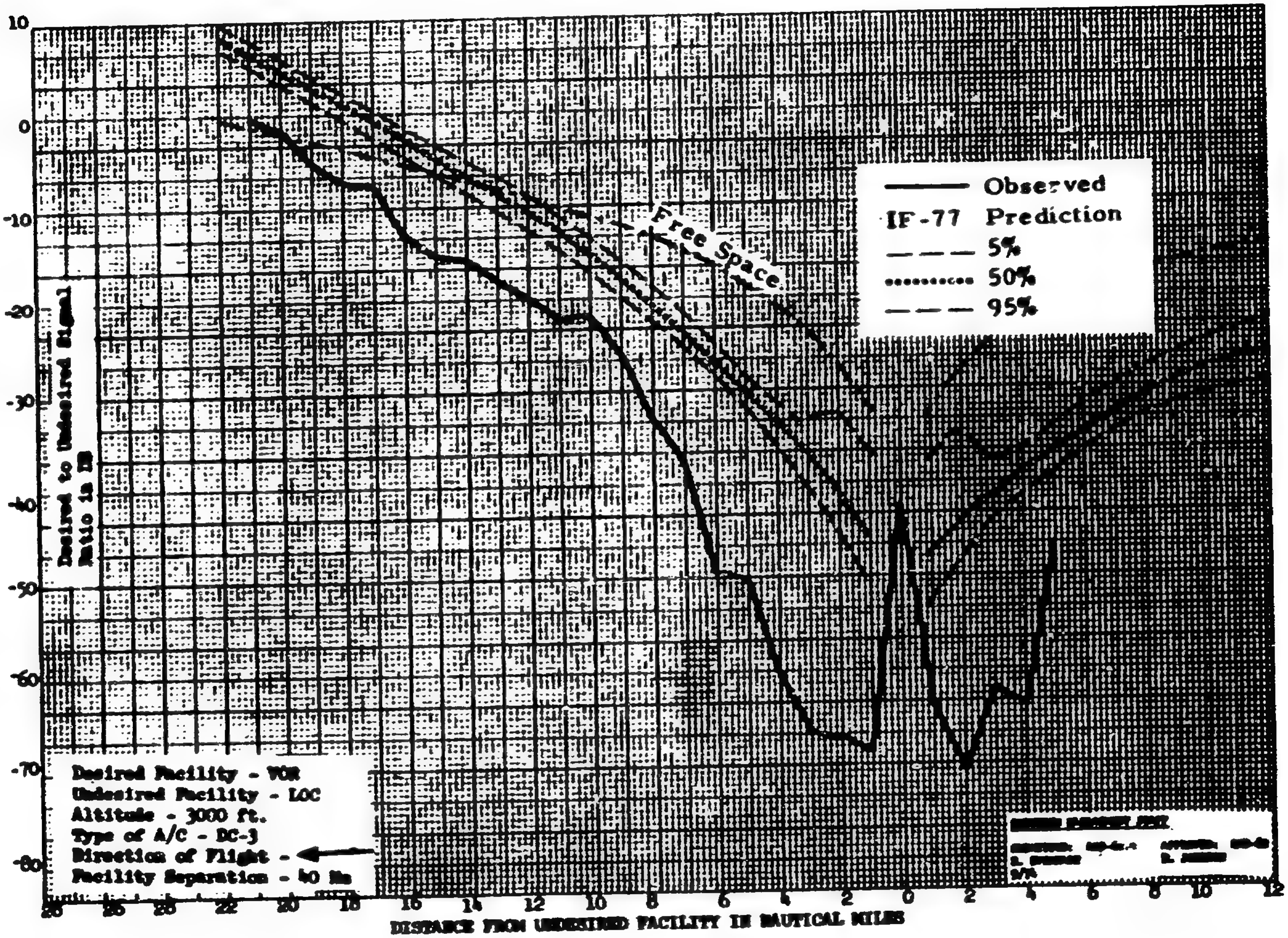


Figure 21. Path 40019, data [10, p. D-3].

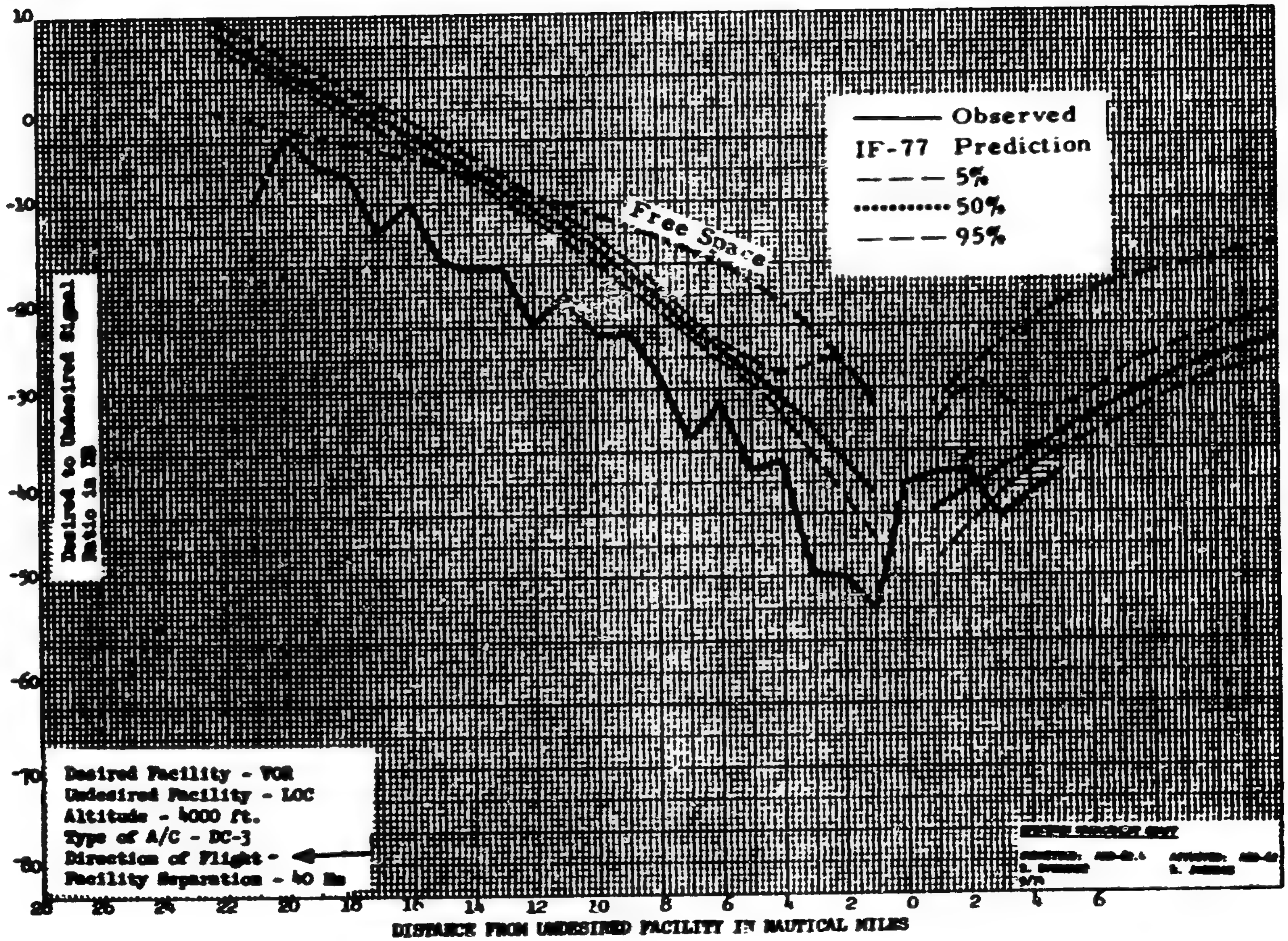


Figure 22. Path 40020, data [10, p. D-4].

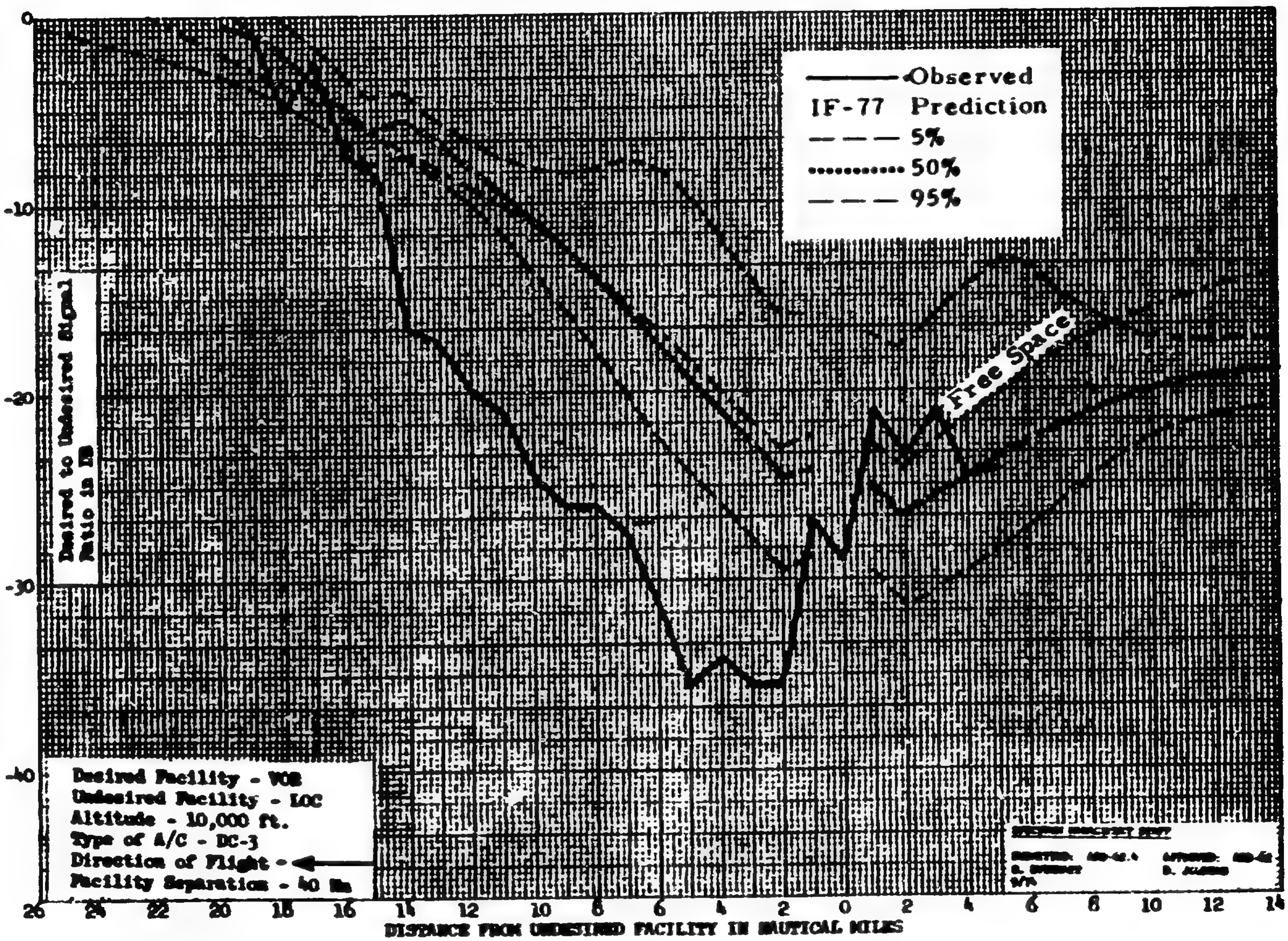


Figure 23. Path 40021, data [10, p. D-5].

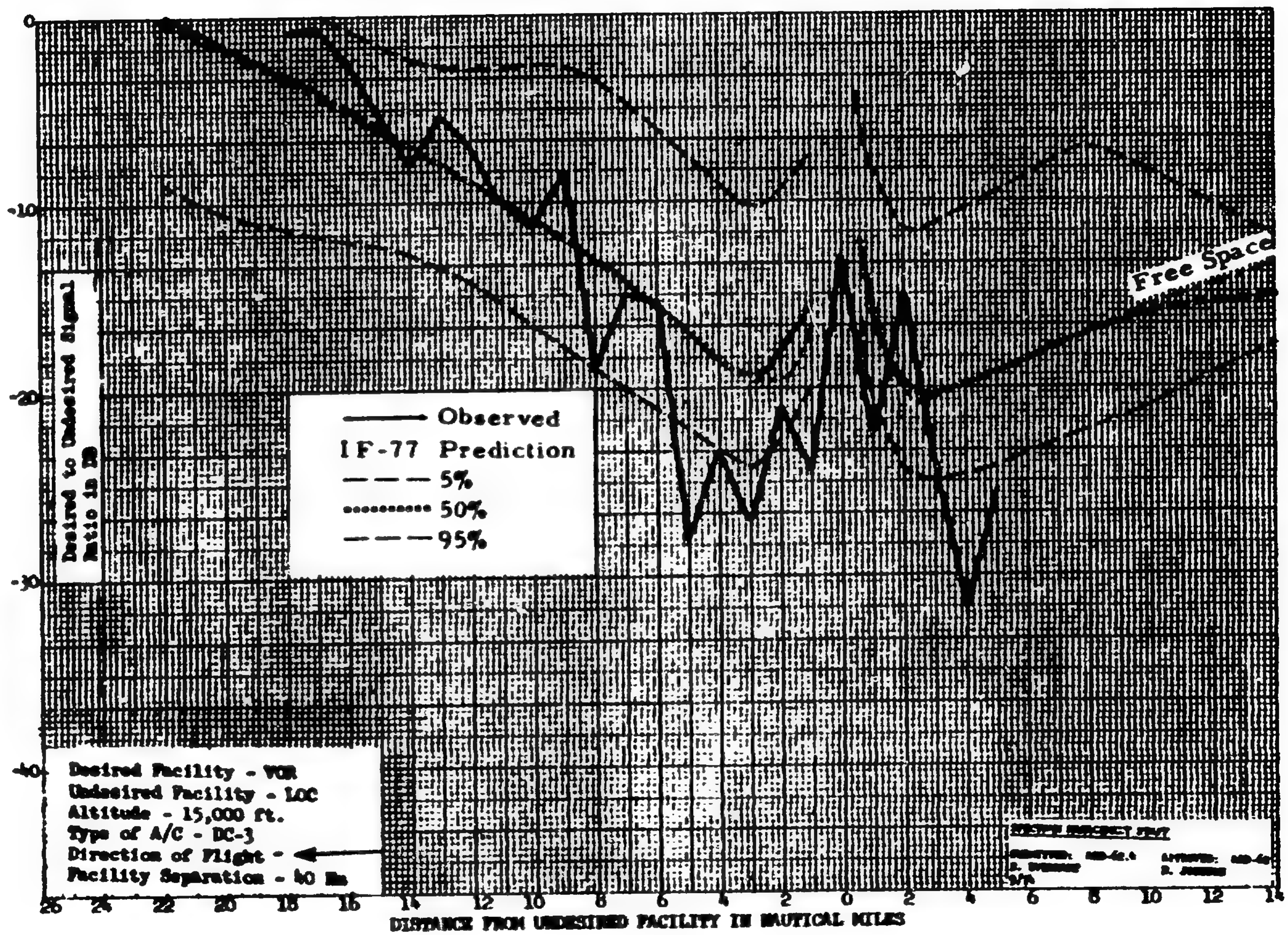


Figure 24. Path 40022, data [10, p. D-6].

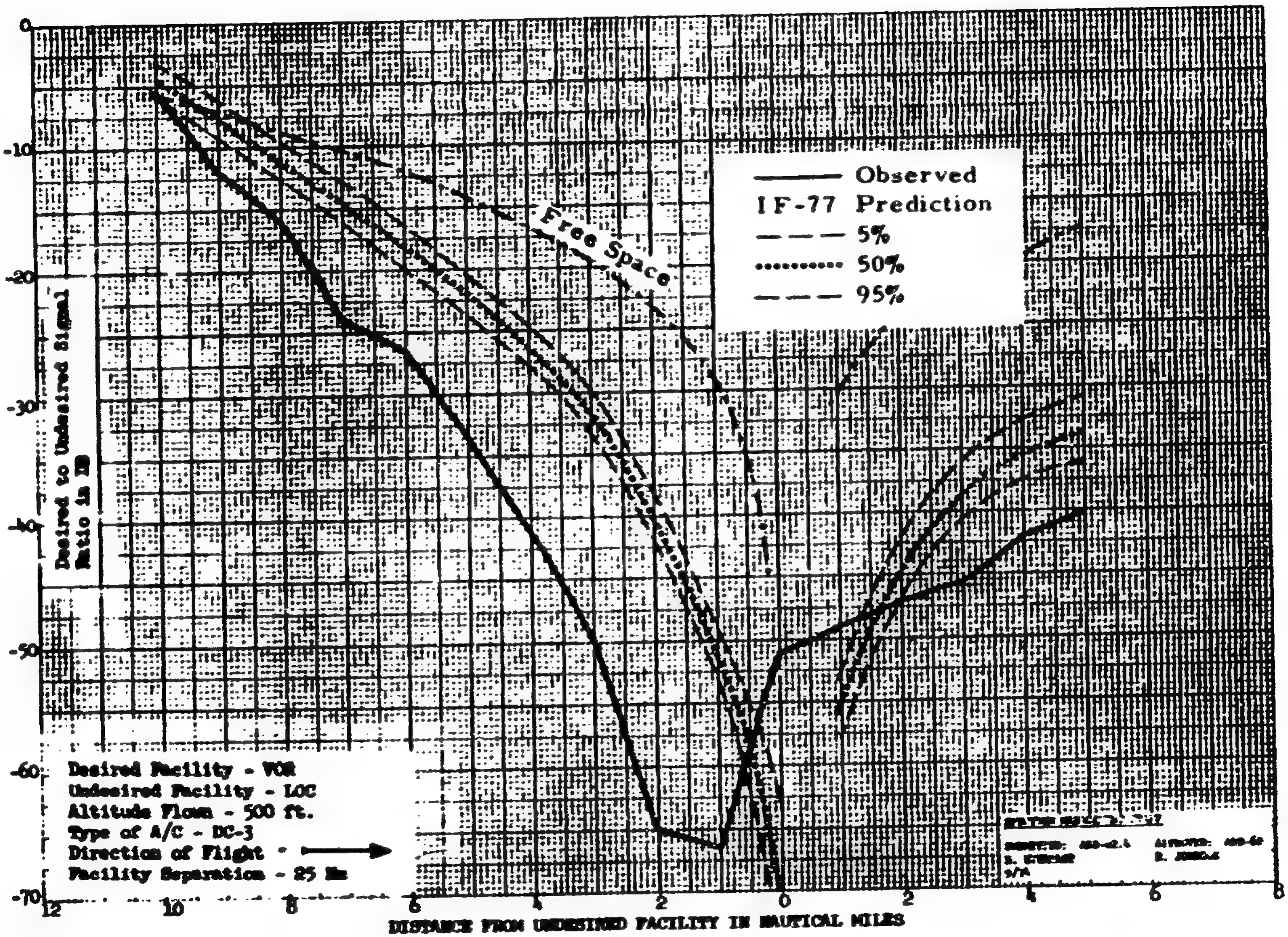


Figure 25. Path 40023, data [10, p. E-1].

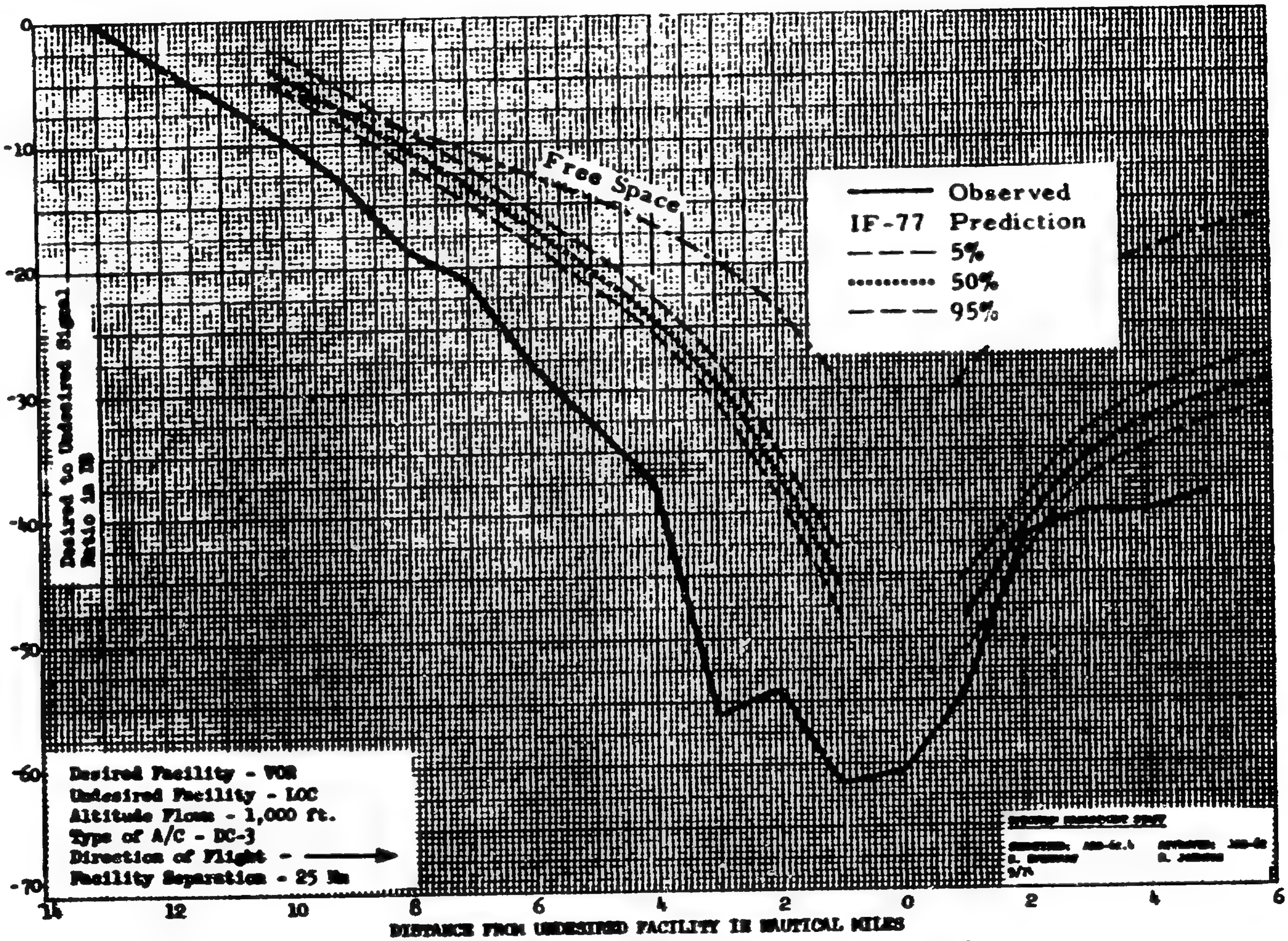


Figure 26. Path 40024, data [10, p. E-2].

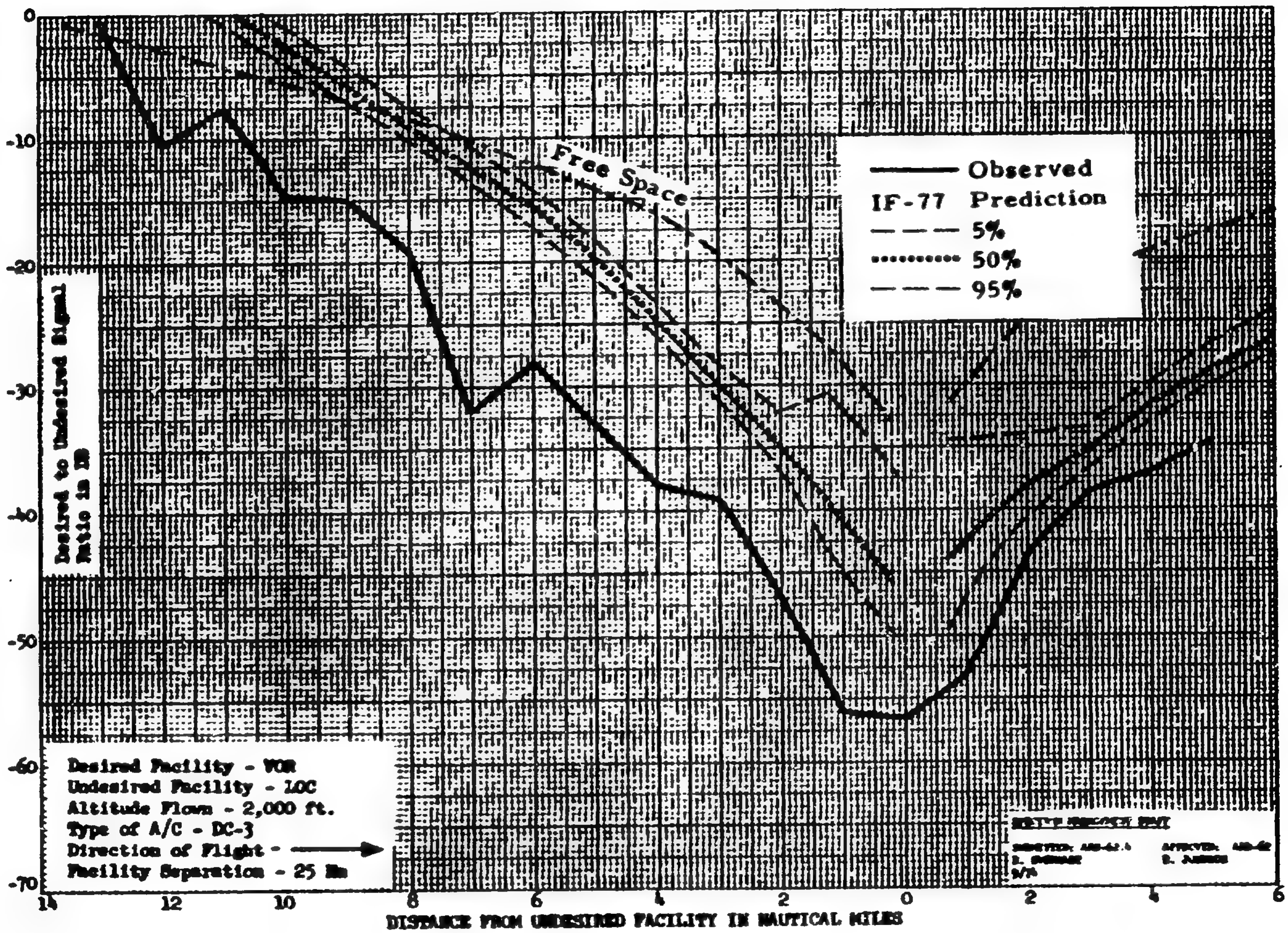


Figure 27. Path 40025, data [10, p. E-3].

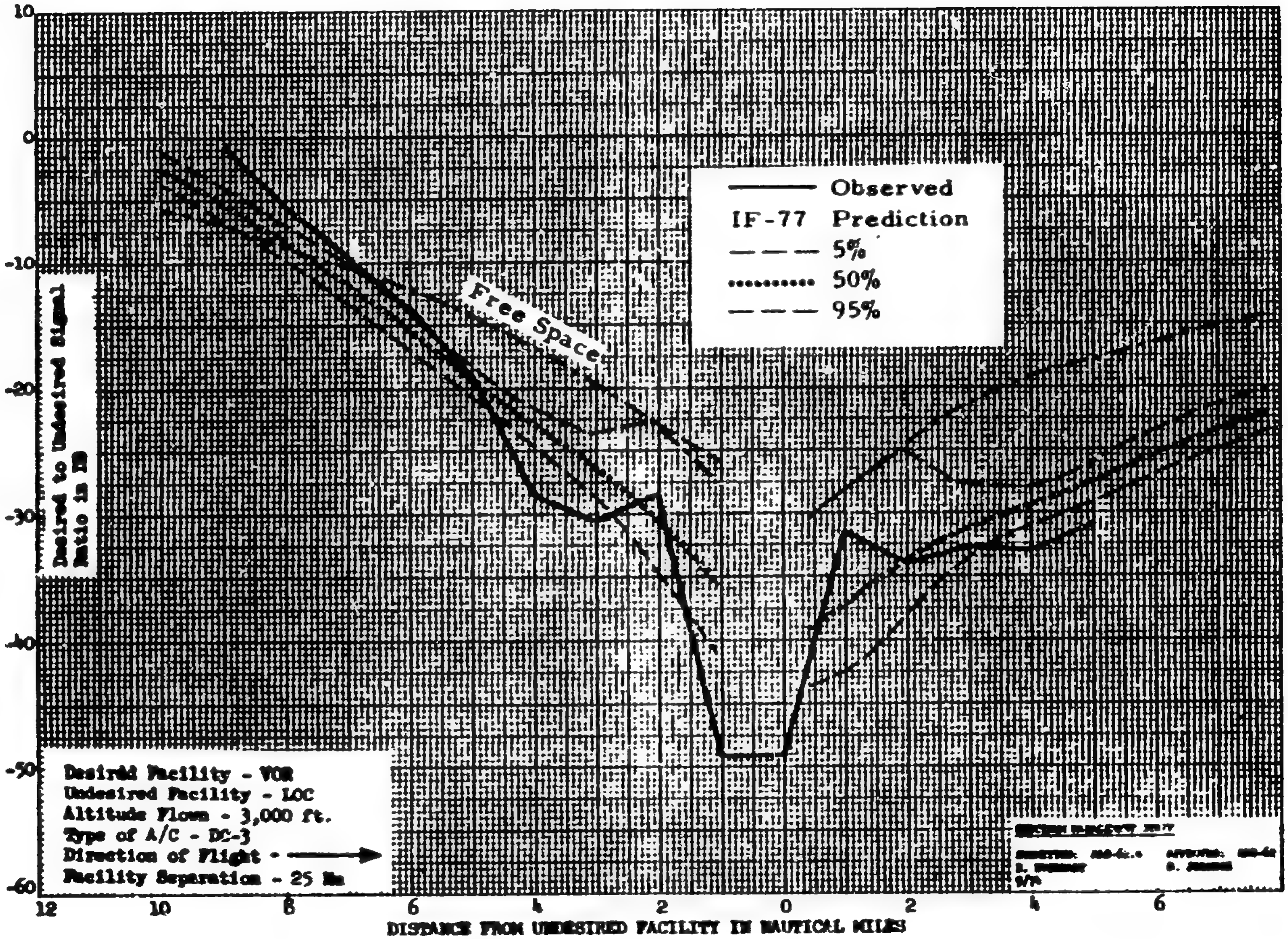


Figure 28. Path 40026, data [10, p. E-4].

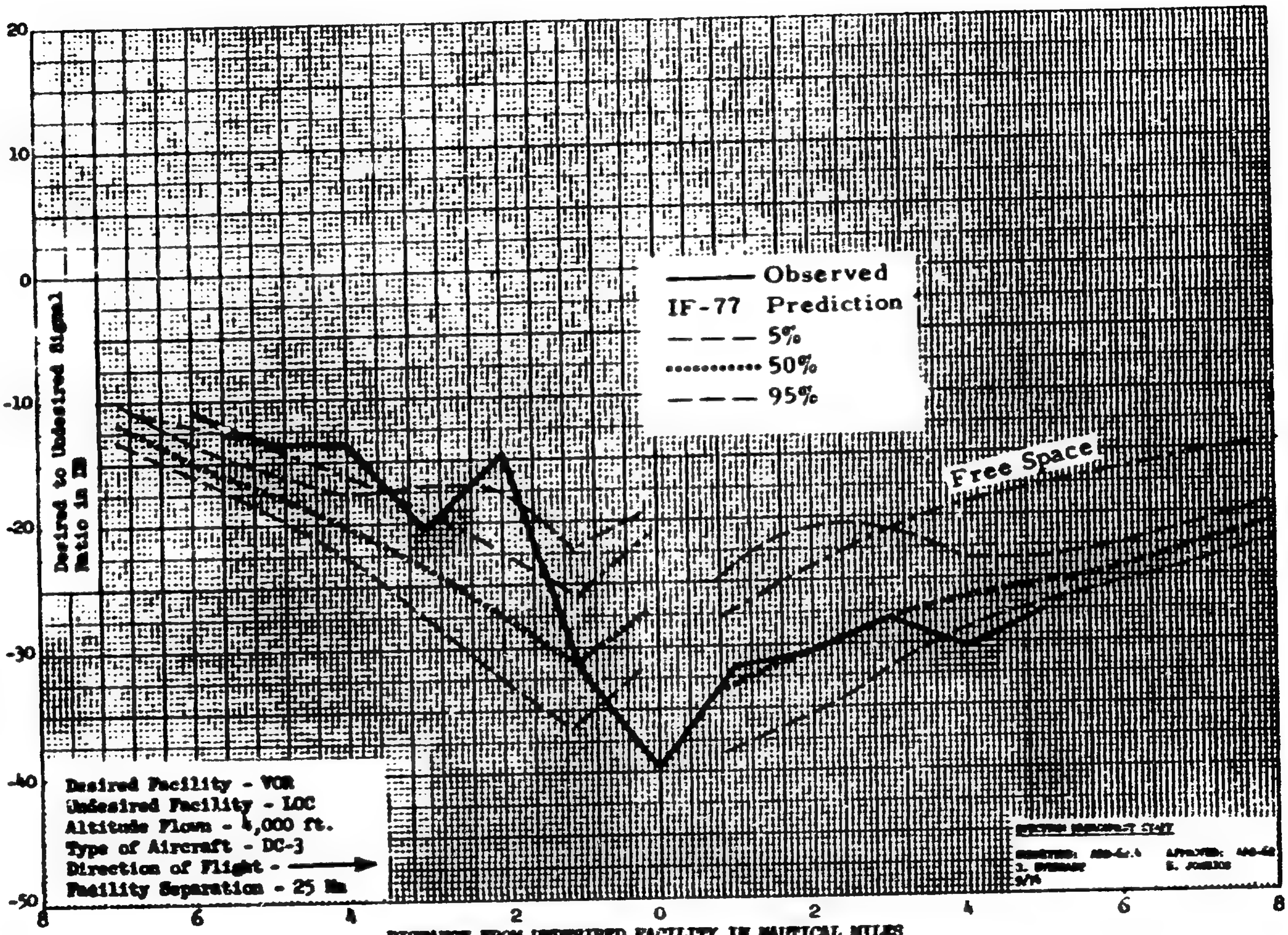


Figure 29. Path 40027, data [10, p. E-5].

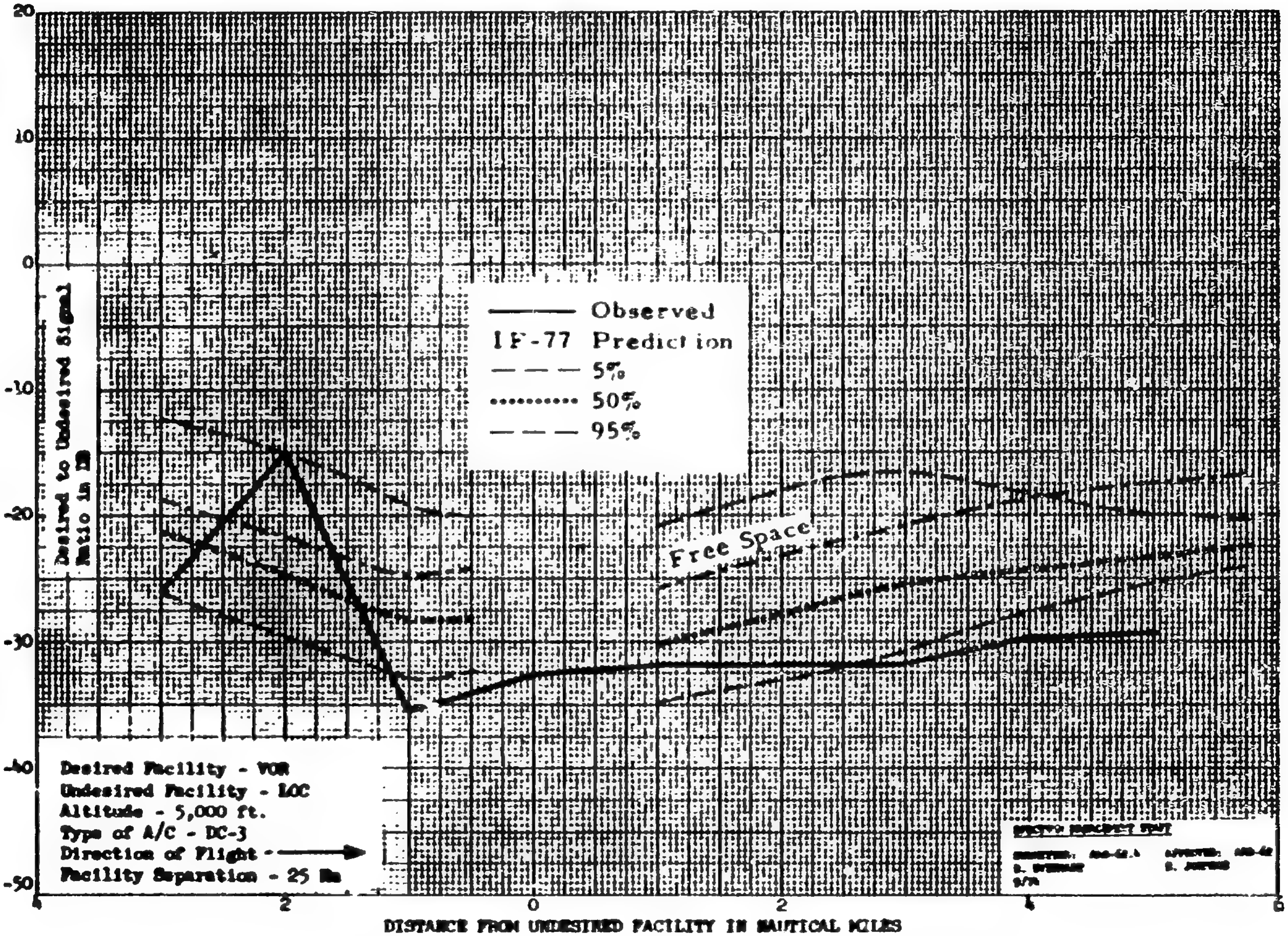


Figure 30. Path 40028, data [10, p. E-6].

4.2 MPATI DATA

Comparisons of predictions made with the IF-77 model and data [13] associated with airborne television transmission of the Midwest Program on Airborne Television Instruction (MPATI) are presented in this section. These air-to-ground transmission loss data were collected at four receiving sites for six propagation paths; i.e., Allegan (path 20001), Cleveland (paths 20002, 20003, 20004), Louisville (path 20005), and Milwaukee (path 20006). About 4130 hours of data are associated with these paths. Statistics for the difference between predicted and observed median basic transmission loss are provided in Table 6 for three propagation prediction models and four path groupings. This difference, ΔL, is calculated as shown in Table 3. The propagation models are IF-77, Free Space, and the OT/TRER 21 model, which were described in Table 3. Of these, OT/TRER 21 provides the best predictions for all paths except the line-of-sight paths (20004 and 20005) where IF-77 is slightly better. Free Space is the worst prediction for all paths. In terms of mean ΔL magnitude, $|\overline{\Delta L}|$, the OT/TRER 21 and IF-77 predictions agree or are 1 dB apart for all groups.

Figure 31 provides comparison of median basic transmission loss distributions as measured and predicted for all six MPATI paths. Figures 32 through 41 show path profiles and parameters. These figures are grouped by path number at the end of this section as shown in the List of Figures.

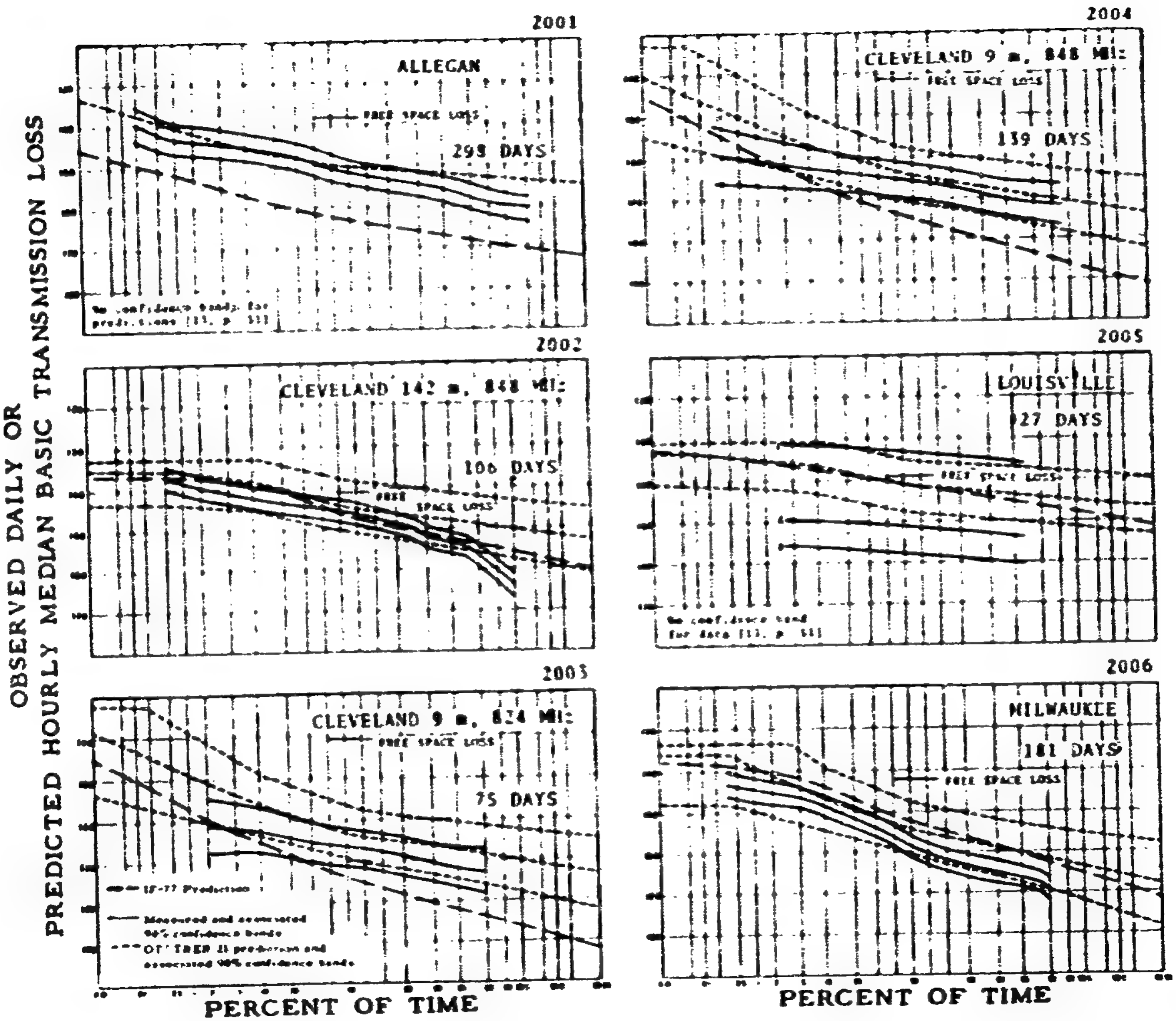


Figure 31. Paths 20001 through 20006, data [13, p.50].

Table 6. Paths 20001 through 20006 ΔL Statistics

Path Site Antenna Height [m] Frequency [MHz]	20001 Allegan 9.1 824	20002 Cleveland 9.1 848	20003 Cleveland 9.1 824	20004 Cleveland 142.3 848	20005 Louisville 99.1 828	20006 Milwaukee 61 848			
Model[a]			ΔL[b] [dB]				$\overline{\Delta L}$[c] [dB]	$\sigma_{\Delta L}$[d] [dB]	MAX|ΔL|[e] [db]
OT/TREM 21	-0.8	-1.7	-3.4	-1.4	-9.8	-4.6	-4	5	-10
IF-77	12.7	9.6	8.2	1.2	-9.5	5.9	5	9	13
Free Space	-12.5	-24.2	-25.7	-4.2	-12	-16.7	-16	8	-26
With 20001 and 20005 neglected.[f]									
OT/TREM 21	----	-1.7	-3.4	-1.4	----	-4.6	-3	2	5
IF-77	----	9.6	8.2	1.2	----	-5.9	3	7	10
Free Space	----	-24.2	-25.7	-4.2	----	-16.7	-18	10	-26
The line-of-sight path with 20001 and 20005 neglected.[f]									
IF-77	----	----	----	1.2	----	----	1	----	1
OT/TREM 21	----	----	----	1.4	----	----	1	----	1
Free Space	----	----	----	-4.2	----	----	-4	----	-4
The three diffraction paths only with 20001 and 20005 neglected.[f]									
OT/TREM 21	----	-1.7	-3.4	----	----	-4.6	-3	1	-5
IF-77	----	9.6	8.2	----	----	-5.9	4	9	10
Free Space	----	-24.2	-25.7	----	----	-16.7	-22	5	-26

(a) Models are ordered by their ability to provide good predictions for these paths with the best predictor listed first. Here, ordering is based on equal weights for ΔL, $\sigma_{\Delta L}$, and MAX|ΔL|.

(b) Median basic transmission loss, L_{bm}, values are used to determine ΔL; i.e., $\Delta L = L_{bm}$ (predicted) L_{bm} (observed).

(c) Mean of ΔL.

(d) Sample standard deviation of ΔL.

(e) The ΔL value (sign included) corresponding to the maximum absolute value of ΔL encountered.

(f) Horizon parameters for path 20001 are unknown, and line loss for path 20005 is unknown [13, Table 6].

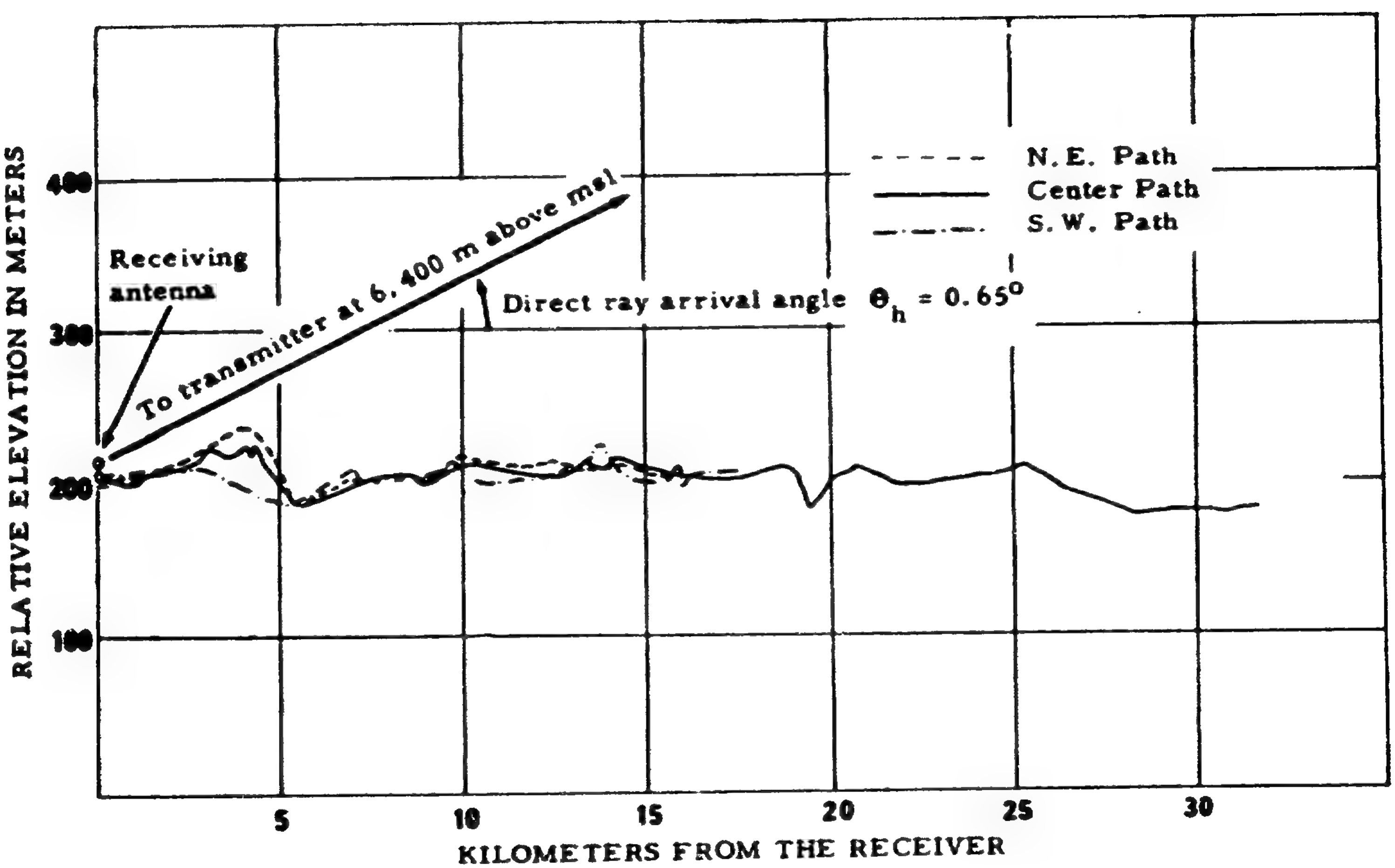


Figure 32. Path 20001, profile [13, p.11].

Path Number: ___ ___ ___ 2 0 0 0 1

Code Number: 1 1 2 8 2 1 0 6 0 1 1 0 2 8 1 1

Location: *Montpelier, Indiana - Allegan, Michigan*

Data type *1390 hourly medians*, Distance *236.9* km, h_{rs} *205.7* m-msl

N_s *303* N-units, a *8525* km, Surface type *average ground*

Climate *continental temperate*, d_e *82.5* km

Frequency *824* MHz, Transmitter output *27.8* dBW, EIRP *36.5* dBW

Δh *20* m, θ *39.7* mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	6400	214.8
gain [dBi], main beam	8.7	13.6
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		Corner Reflector
Horizon distance [km]		0.06
elevation [m-msl]		217.9
elevation angle [deg]		
Location, latitude	40°32'N	42°36'16"N
longitude	85°17'W	85°57'23"W
Path bearing		
elevation [m-msl]		205.7

Other information:

OT/TRER 21

Figure 33. Path 20001, parameters [13, p. 69].

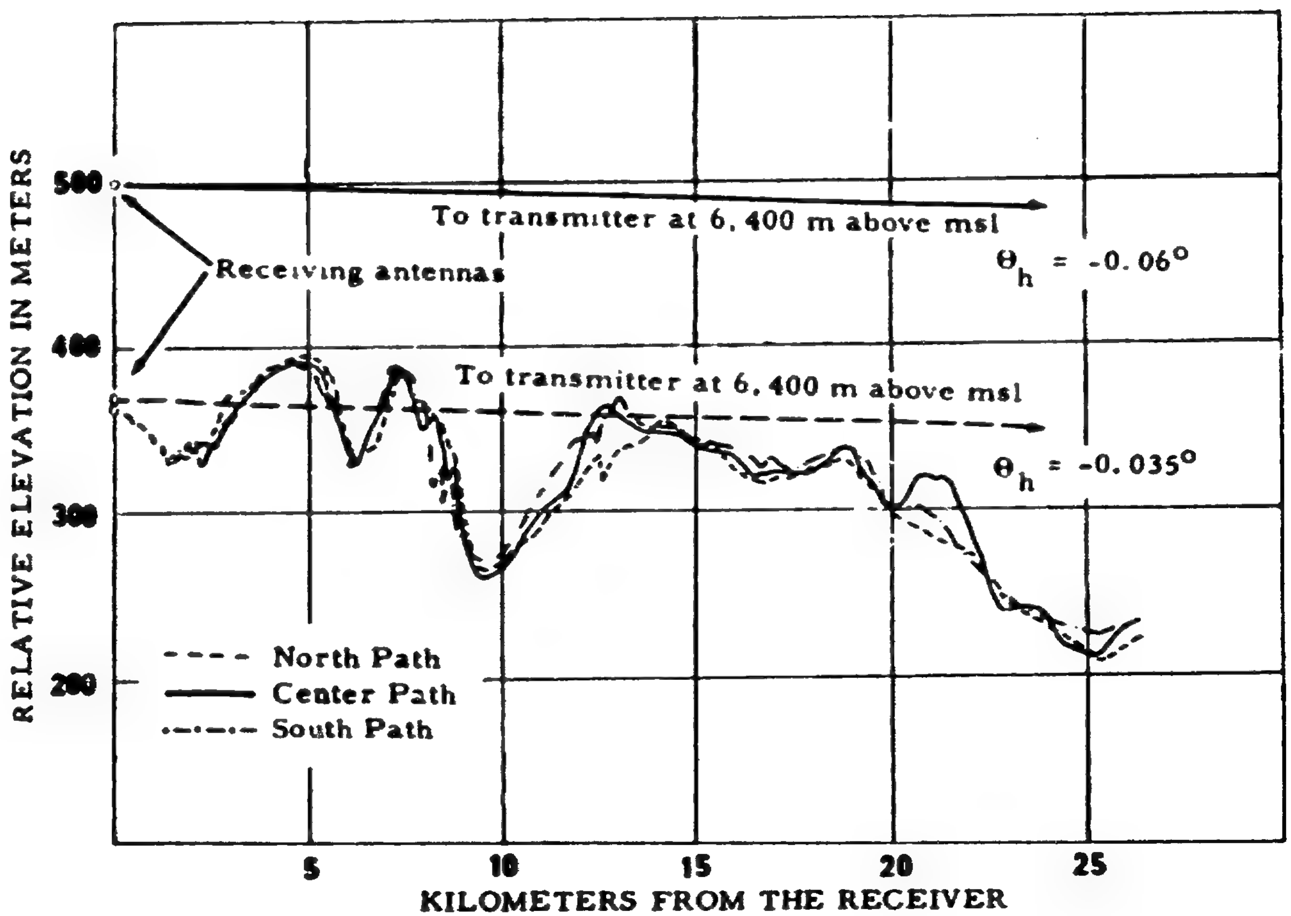


Figure 34. Paths 20002 through 20004, profile [13, p. 12].

Path Number: _ _ _ 2 0 0 0 2

Code Number: 1 1 2 8 2 0 0 6 0 1 1 0 2 8 1 1

Location: *Montpelier, Indiana - Cleveland, Ohio*

Data type *695 hourly medians*, Distance *318.6* km, h_{rs} *356.3* m-msl

N_s *298* N-units, a *8446* km, Surface type *average ground*

Climate *continental temperate*, d_e *112.4* km

Frequency *848* MHz, Transmitter output *27.0* dBW, EIRP *35.2* dBW

Δh *30* m, θ *5.4* mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	6400	365.4
gain [dBi], main beam	8.2	14.9
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		Corner Reflector
Horizon distance [km]		4.9
elevation [m-msl]		390
elevation angle [deg]		
Location, latitude	42°32'N	41°16'50"N
longitude	85°17'W	81°37'22"W
Path bearing		
elevation [m-msl]		356.3

Other information:

OT/TRER 21

Figure 35. Path 20002, parameters [13, p. 69].

Path Number: 2 0 0 0 3

Code Number: 1 1 2 8 2 0 0 6 0 1 1 0 2 8 1 1

Location: *Montpelier, Indiana - Cleveland, Ohio*

Data type *375 hourly medians*, Distance *318.6* km, h_{rs} *356.3* m-msl

N_s *298* N-units, a *8446* km, Surface type *average ground*

Climate *continental temperate*, d_e *112.4* km

Frequency *824* MHz, Transmitter output *27.8* dBW, EIRP *36.5* dBW

Δh *30* m, θ *5.4* mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	6400	365.4
gain [dBi], main beam	8.7	14.0
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		Corner Reflector
Horizon distance [km]		4.9
elevation [m-msl]		390
elevation angle [deg]		
Location, latitude	42°32'N	41°16'50"N
longitude	85°17'W	81°37'22"W
Path bearing		
elevation [m-msl]		356.3

Other information:

OT/TRER 21

Figure 36. Path 20003, parameters [13, p. 69].

Path Number: _ _ _ 2 0 0 0 4

Code Number: 1 1 2 8 1 0 0 6 0 1 1 0 2 8 1 1

Location: *Montpelier, Indiana - Cleveland, Ohio*

Data type *530 hourly medians*, Distance *318.6* km, h_{rs} *356.3* m-msl

N_s *298* N-units, a *8446* km, Surface type *average ground*

Climate *continental temperate*, d_e *101.9* km

Frequency *848* MHz, Transmitter output *27.0* dBW, EIRP *35.2* dBW

Δh *30* m, θ *-5.6* mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	6400	498.6
gain [dBi], main beam	8.2	14.6
height [m], above site surface		142.3
line loss [dB]		
polarization	H	H
type		Corner Reflector
Horizon distance [km]		4.9
elevation [m-msl]		390
elevation angle [deg]		
Location, latitude	42°32'N	41°16'50"N
longitude	85°17'W	81°37'22"W
Path bearing		
elevation [m-msl]		356.3

Other Information:

OT/TRER 21

Figure 37. Path 20004, parameters [13, p. 69].

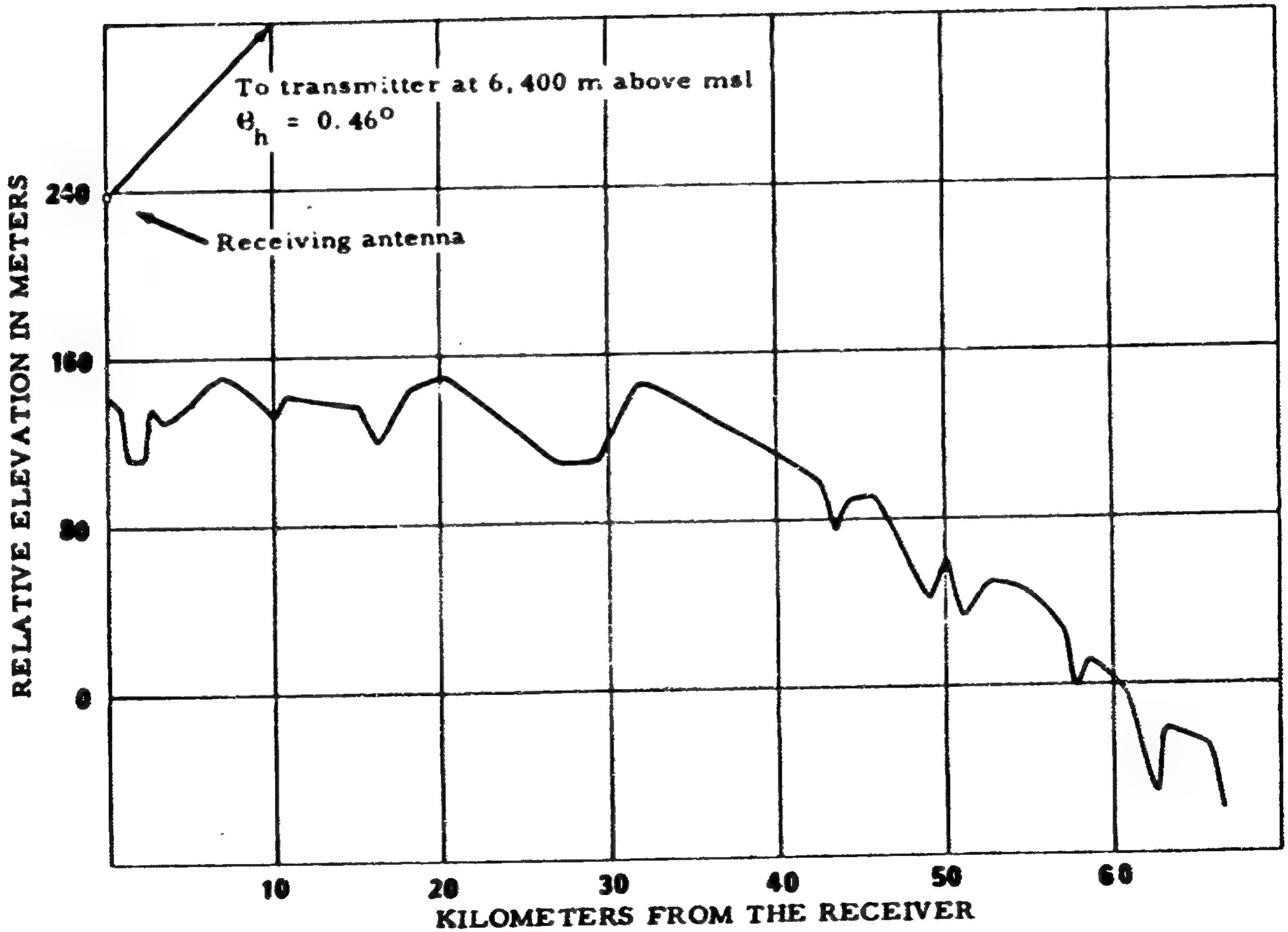


Figure 38. Path 20005, profile [13, p. 13].

Path Number: _ _ _ 2 0 0 0 5

Code Number: 1 1 2 8 1 0 0 6 0 1 1 0 2 8 1 1

Location: Montpelier, Indiana - Louisville, Kentucky

Data type 135 hourly medians, Distance 257.5 km, h_{rs} 138.7 m-msl

N_s 305 N-units, a 8541 km, Surface type average ground

Climate continental temperate, d_e 82.8 km

Frequency 824 MHz, Transmitter output 27.8 dBW, EIRP 36.5 dBW

Δh 10 m, θ -12.5 mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	6400	237.8
gain [dBi], main beam	8.7	13.9
height [m], above site surface		99.1
line loss [dB]		
polarization	H	H
type		Corner Reflector
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	40°32'N	38°14'50"N
longitude	85°17'W	85°45'50"W
Path bearing		
elevation [m-msl]		138.7

Other information:

OT/TRER 21

Figure 39. Path 20005, parameters [13, p. 69].

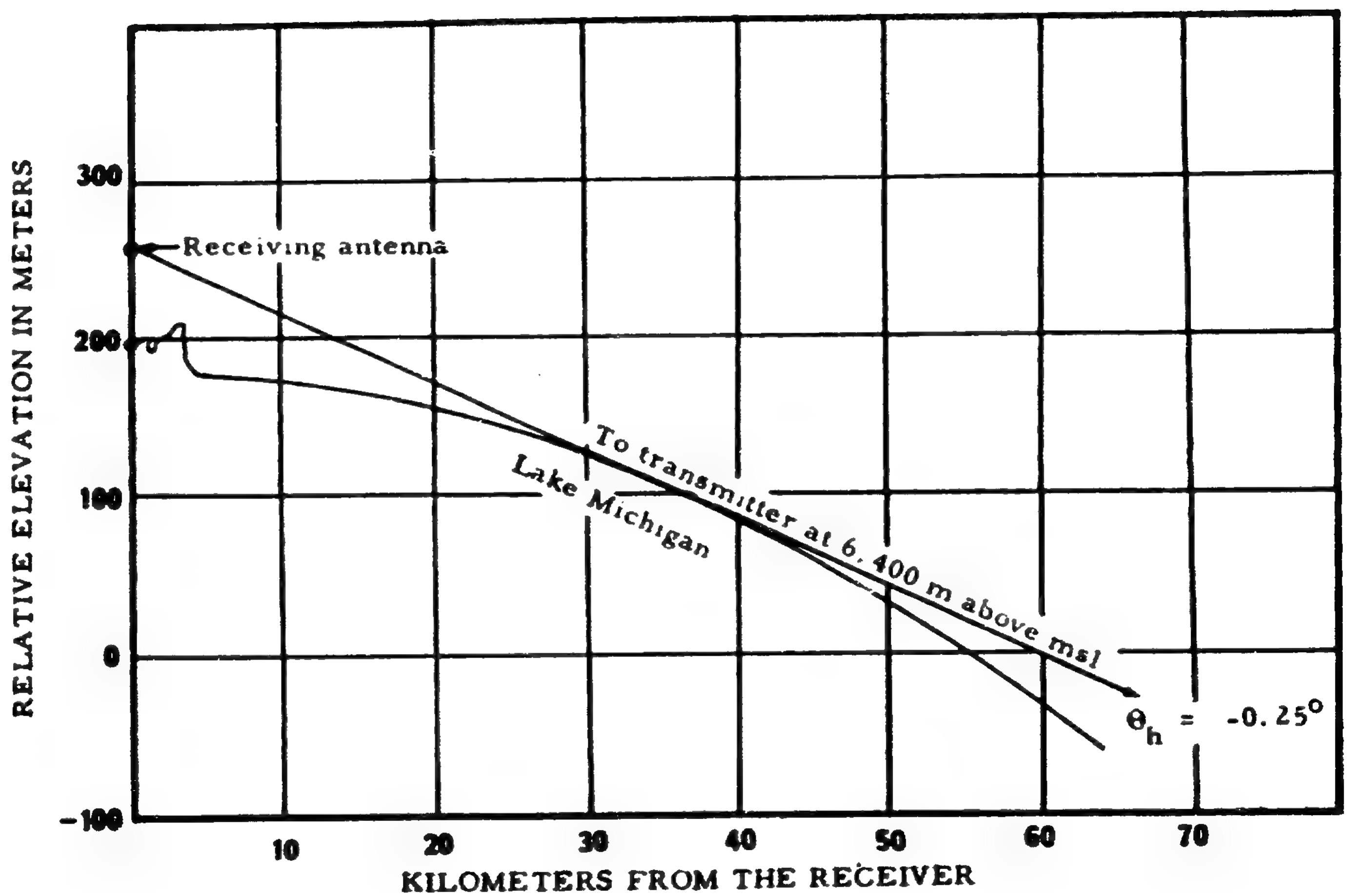


Figure 40. Path 20006, profile [13, p. 14].

Path Number: _ _ _ 2 0 0 0 6

Code Number: 1 1 2 8 1 0 0 6 0 1 1 0 2 8 1 1

Location: *Montpelier, Indiana - Milwaukee, Wisconsin*

Data type *905 hourly medians*, Distance *357.5* km, h_{rs} *176.8* m-msl

N_s *304* N-units, a *8541* km, Surface type *fresh water*

Climate *continental temperate*, d_e *118.2* km

Frequency *848* MHz, Transmitter output *27.0* dBW, EIRP *35.2* dBW

Δh *0* m, θ *0* mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	6400	259.1
gain [dBi], main beam	8.2	12.5
height [m], above site surface		61
line loss [dB]		
polarization	H	H
type		Corner Reflector
Horizon distance [km]		319.8
elevation [m-msl]		176.8
elevation angle [deg]		
Location, latitude	42°32'N	43°05'24"N
longitude	85°17'W	87°54'07"W
Path bearing		
elevation [m-msl]		198.1

Other information:

OT/TRER 21

Figure 41. Path 20006, parameters [13, p. 69].

Table 7. Paths 10031 through 12446 ΔL Statistics

Model[(a)]	$\overline{\Delta L}$[(b)] [dB]	$\sigma_{\Delta L}$[(c)] [dB]	MAX|ΔL|[(d)] [dB]	Path[(e)] No.
---All 181 Paths[(f)]---				
ESSA 1970	- 3	8	-34	11998
IF-77	- 5	9	-32	11978
TN 101	- 7	9	-33	12350
Free Space	-36	26	-96	10260
---The 77 line-of-sight paths---				
ESSA 1970	0	8	21	10299
IF-77	- 6	8	-32	11978
TN 101	-12	10	-33	12350
Free Space	-12	9	-32	11978
---The 104 beyond-the-horizon paths---				
TN 101	- 4	7	-22	12179
IF-77	- 5	9	-30	11998
ESSA 1970	- 5	7	-34	11998
Free Space	-53	19	-96	10260

(a) Models are ordered by their ability to provide good predictions for these paths with the best predictor listed first. Here, ordering is based on equal weights for $\overline{\Delta L}$, $\sigma_{\Delta L}$, and MAX|ΔL|.

(b) Difference between predicted and observed median basic transmission loss (Table 3). The mean ΔL is $\overline{\Delta L}$.

(c) Sample standard deviation of ΔL.

(d) The ΔL value (sign included) corresponding to the maximum absolute value of ΔL encountered. This statistic picks out the worst ΔL's encountered. They may indicate poor data as well as poor predictions or simply that the model was not appropriate for the path; e.g., Free Space for beyond-the-horizon paths.

(e) The path number for the path with MAX|ΔL|.

(f) Of the 202 paths for which predictions were made, only 181 could be used in this analysis since 21 do not have values for L_{bm} (observed).

4.3 OT/TRER 16 DATA

Comparisons of predictions made with the IF-77 model and data from DOC Report OT/TRER 16 are given in this section. Transmission loss measurements for nearly 800 point-to-point tropospheric radio propagation paths are summarized in OT/TRER 16 [25]. Many of these are not suitable for comparison with predictions made with the IF-77 model since the IF-77 model is not applicable to paths with two horizons formed by irregular terrain (Sec. 3). However, the 202 paths presented here were found to have parameters appropriate for the IF-77 model comparisons. These paths provide about 866,000 hours of data (Table 1).

Statistics for the difference between predicted and observed median basic transmission loss, ΔL, are provided in Table 7 for four propagation prediction models and three path groupings; i.e., all paths, line-of-sight paths, and beyond-the-horizon paths. The propagation models used are IF-77, ESSA 1970, Free Space, and TN 101 (Table 2), where predictions for the ESSA 1970 and TN 101 models are as provided in OT/TRER 16. Of these, ESSA 1970 provides the best predictions for all groups except the beyond-the-horizon group where TN 101 and IF-77 are slightly better. In all three groups, IF-77 is the second best predictor, and Free Space is the worst predictor. In terms of mean ΔL, the line-of-sight group has the most spread between prediction methods where $\overline{\Delta L}$ values of 0, -6, and -12 dB were obtained using the ESSA 1970, IF-77, and TN 101 models, respectively.

Figures 42 through 354 show path parameters, path profiles, and comparisons of data with predictions. Sometimes predictions made with two or more models coincide and the lines are put one on top of the other on the graphs. Frequency, f, and antenna heights, $H_{1,2}$, above ground are given on the profiles. The figures are grouped by path number at the end of this section, as shown in the List of Figures. Path numbers shown with the data are those of OT/TRER 16 which may be obtained by subtracting 10000 from the path number used in this report. For example,

path number 10031 used in the caption of Figure 42 corresponds to the Report OT/TRER 16 path number of 31 which is used with the data in Figure 42.

Predictions for the TN 101 and ESSA 1970 models provided with the data in OT/TRER 16 are still shown on the figures. Predictions resulting from use of the IF-77 model are shown with the data as lines of large dots (i.e.,) and designated "FAA." Marks indicating free space basic transmission loss level have been added to the data graph as a long dash(es) located in the right margin and designated "F.S." When one graph may be applicable to more than one path, F.S. is followed by a path number; i.e., F.S. 352 implies free space level for path 352 (using the OT/TRER 16 notation). If the free space level is beyond the range of the graph, the free space loss is given followed by F.S. at some arbitrary location; i.e., 152.6 dB F.S.

Some observations concerning these comparisons are as follows:

(1) The same terrain profile may be applicable to several paths when a path parameter other than terrain is varied. For example, paths 10187 through 10191 (Figs. 52 and 55) involve a single profile and five frequencies. Other similar situations occur many times; e.g., Figures 59, 62, 66, etc.

(2) The measured loss for the knife-edge diffraction path of Figure 174 (path 11998) seems excessive, and some conversion error in recording the data is suspected (A. G. Longley, NTIA, informal communication).

(3) Variability about the median for the ESSA 1970 and TN 101 always agree because the TN 101 formulation was used in both predictions (Table 2). The variability for the IF-77 is usually similar because variability formulation used in it evolved from TN 101 methods, but significant

differences can occur. For example, the difference between IF-77 and TN 101 variability shown in Figure 248 occurs because the TN 101 method used is a special formulation for knife-edge diffraction paths that involves the convolution of variabilities for path segments on either side of the knife-edge [33, Sec. 10.8]. Although this more complex formulation can give better results for some specific knife-edge paths, it is no longer recommended for general application to knife-edge paths (A. G. Longley, NTIA, informal communication).

(4) The TN 101 variability formulation can predict signal levels that are too high with respect to free space, and the IF-77 formulation includes factors to avoid this difficulty [15, p. 40]. This is illustrated by the predictions shown in Figure 325.

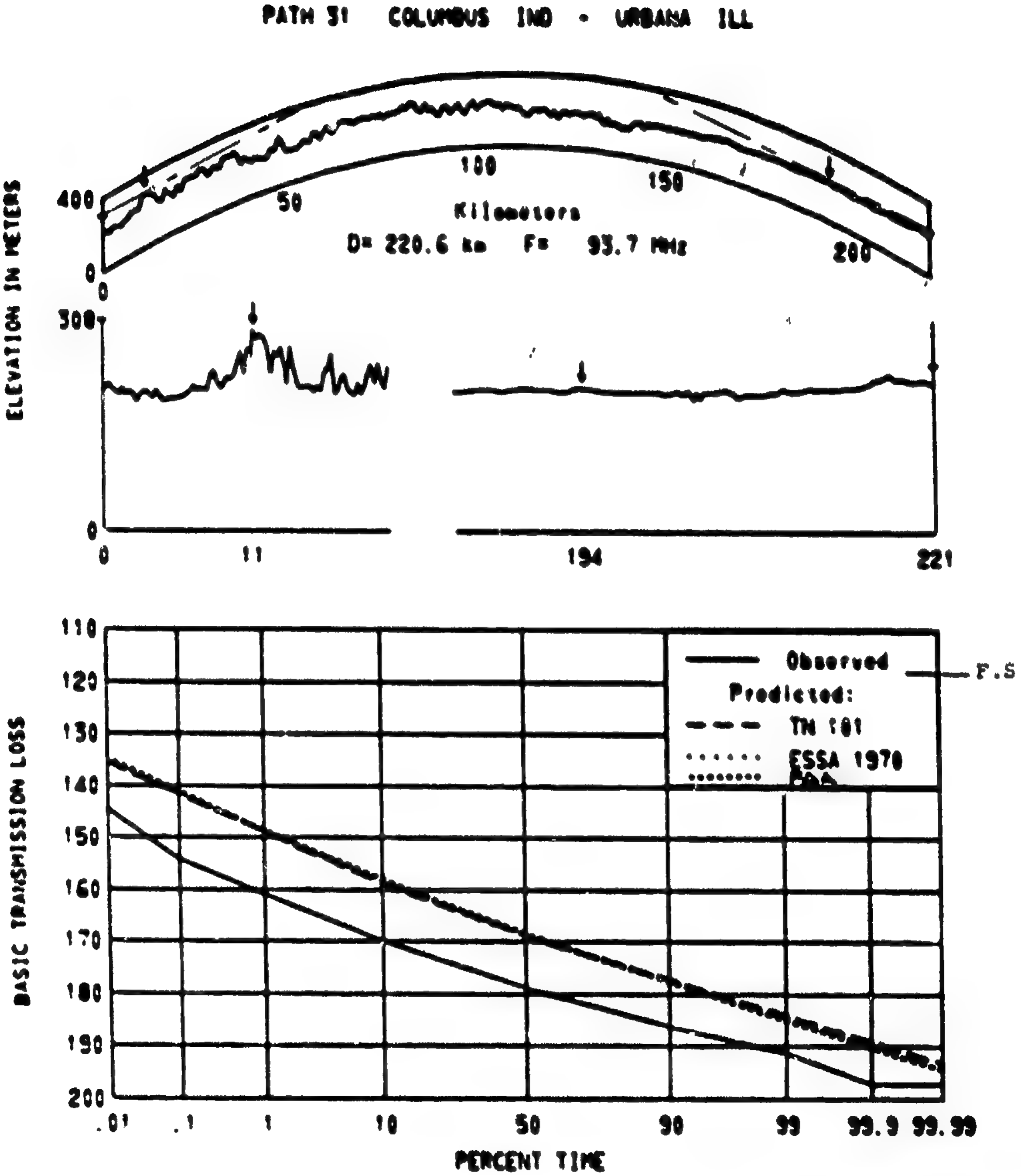


Figure 42. Path 10031, profile and predictions.

Path Number: _ _ _ 1 0 0 3 1

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Columbus, Indiana - Urbana, Illinois*

Data type *11854 hourly medians*, Distance 220.6 km, h_{rs} 211.5 m-msl

N_s 305 N-units, a 8557 km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency 93.7 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 60. m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	307.5	246.9
gain [dBi], main beam		
height [m], above site surface		27.4
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		26.4
elevation [m-msl]		211.5
elevation angle [deg]		
Location, latitude	39°11'05"N	40°06'39"N
longitude	85°57'17"W	88°13'41"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.25

Figure 43. Path 10031, parameters.

PATH 35 CHICAGO ILL - ALLEGAN MICH

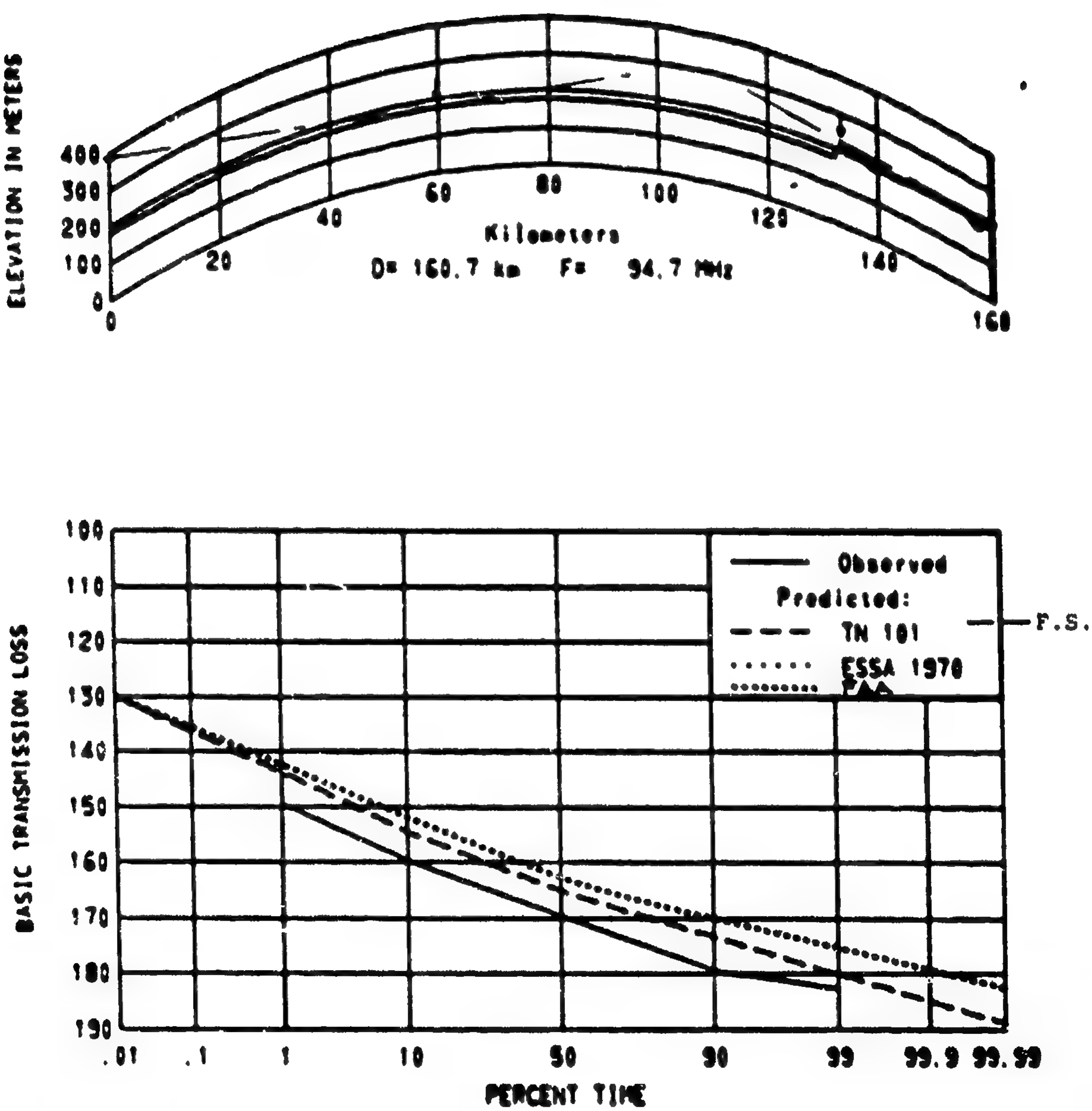


Figure 44. Path 10035, profile and predictions.

Path Number: _ _ _ 1 0 0 3 5

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 2 4 1 1

Location: *Chicago, Illinois - Allegan, Michigan*

Data type *2416 hourly medians*, Distance *160.7* km, h_{rs} *176.8* m-msl

N_s *306* N-units, a *8574* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *94.7* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *18* m, ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	385.0	214.8
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		27.2
elevation [m-msl]		219.5
elevation angle [deg]		
Location, latitude	41°52'57.4"N	42°36'22"N
longitude	87°38'15"W	85°57'07"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.7

Figure 45. Path 10035, parameters.

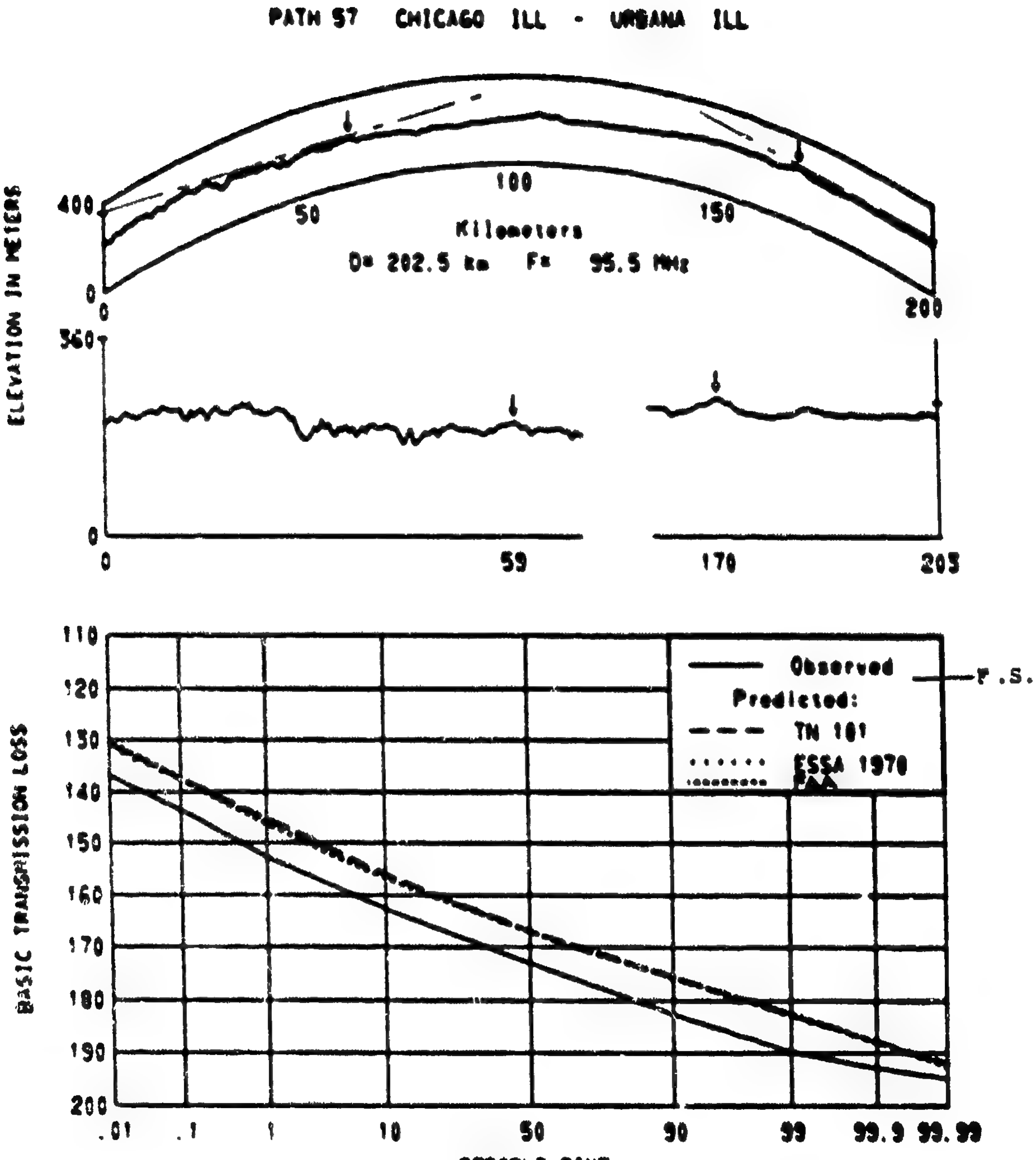


Figure 46. Path 10057, profile and predictions.

Path Number: _ _ _ 1 0 0 5 7

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 2 8 1 1

Location: Chicago, Illinois - Urbana, Illinois

Data type 10699 hourly medians, Distance 202.5 km, h_{rs} 209.1 m-msl

N_s 306 N-units, a 8574 km, Surface type average ground

Climate continental temperate, de ______ km

Frequency 95.5 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 48 m, " ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	360.3	246.9
gain [dBi], main beam		
height [m], above site surface		27.4
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		32.4
elevation [m-msl]		255.4
elevation angle [deg]		
Location, latitude	41°55'35"N	40°06'39"N
longitude	88°00'22"W	88°13'41"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.16

Figure 47. Path 10057, parameters.

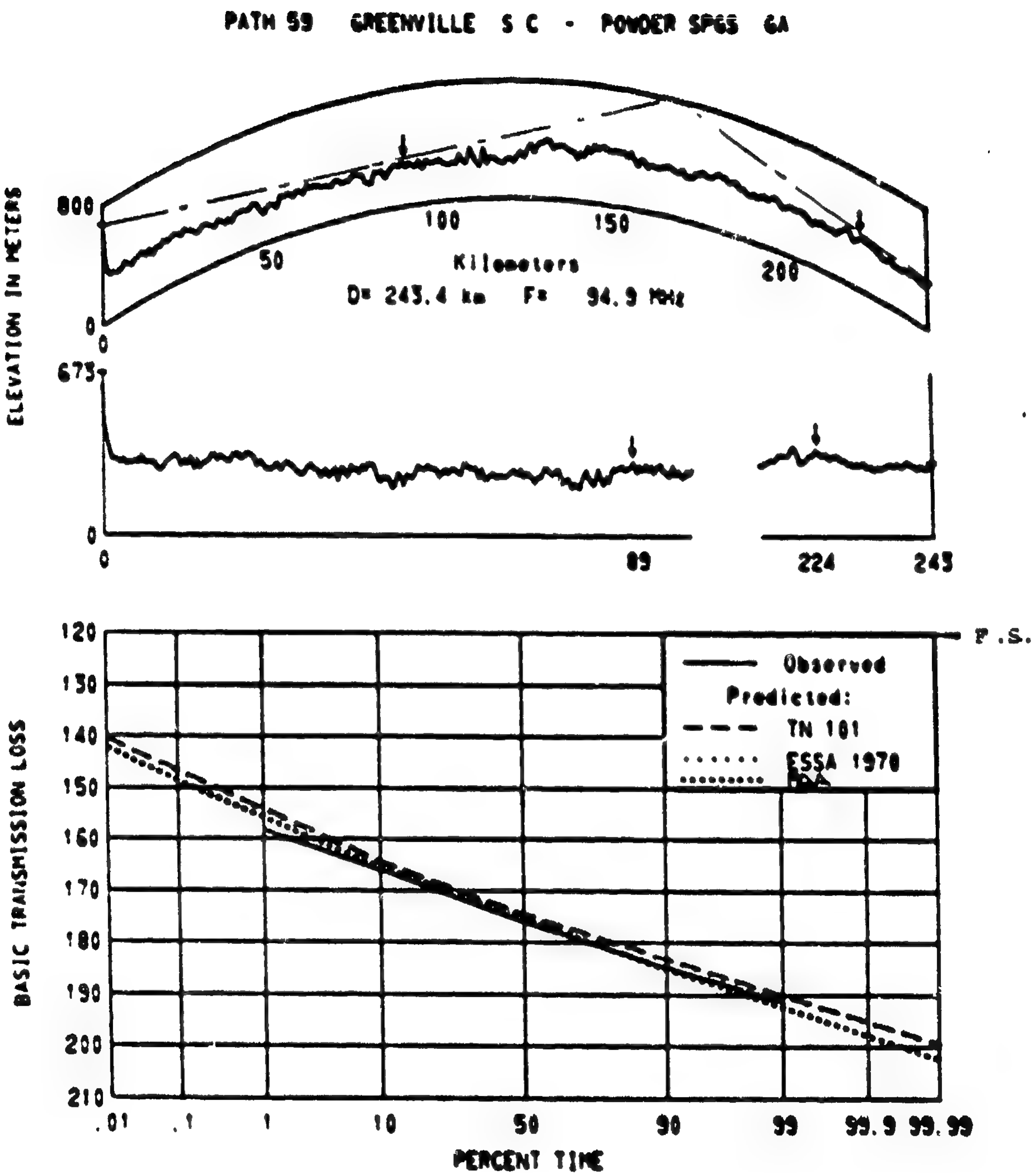


Figure 48. Path 10059, profile and predictions.

Path Number: _ _ _ 1 0 0 5 9

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 2 2 1 1

Location: *Greenville, South Carolina - Powder Springs, Georgia*

Data type *1820 hourly medians*, Distance *243.4* km, h_{rs} *300* m

N_s *302* N-units, a *8509* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *94.9* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *95* m, σ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	672.7	309.3
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		19.4
elevation [m-msl]		359.7
elevation angle [deg]		
Location, latitude	34°56'29"N	33°52'01"N
longitude	82°24'40"W	84°43'12"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.36

Figure 49. Path 10059, parameters.

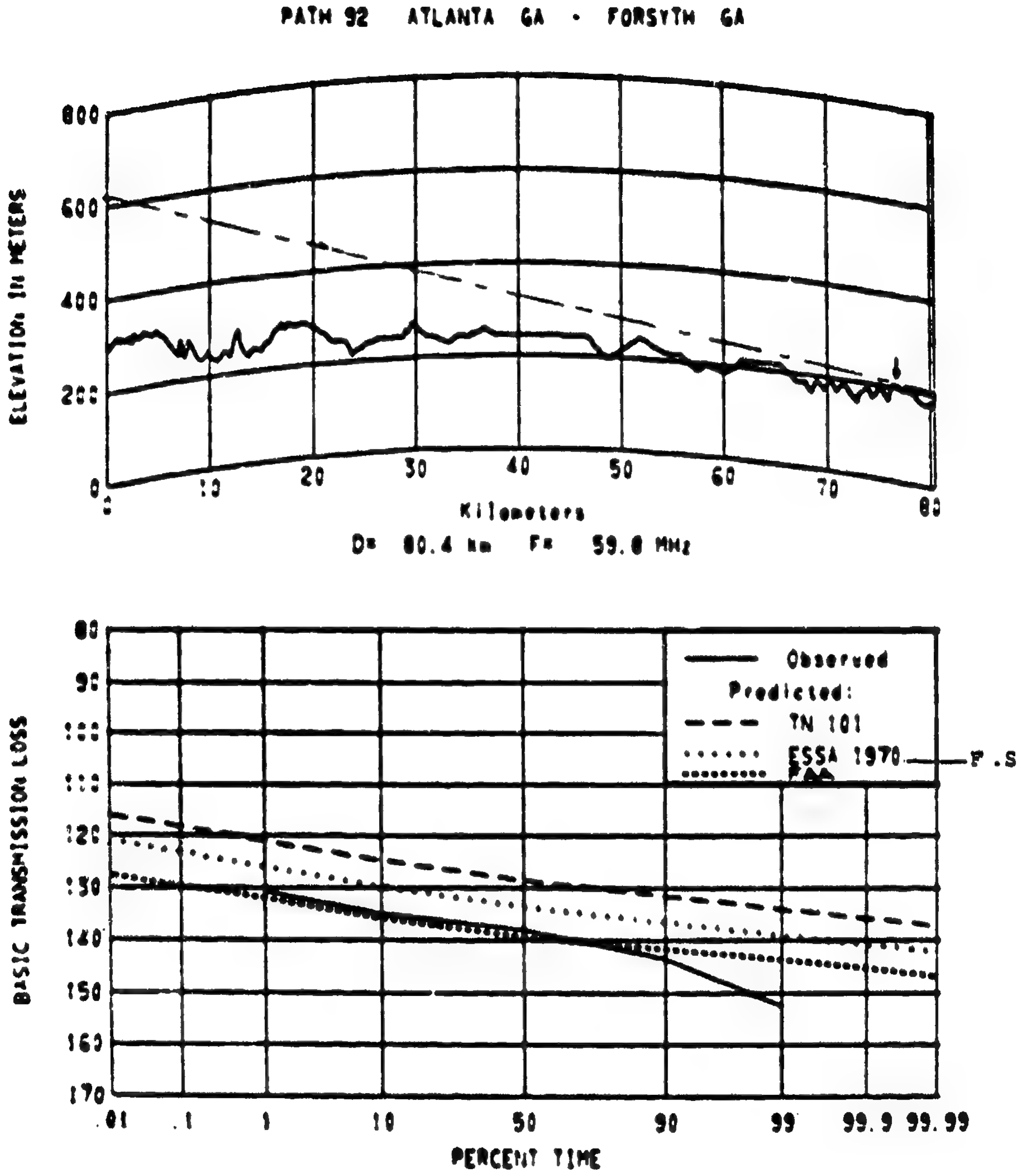


Figure 50. Path 10092, profile and predictions.

Path Number: _ _ _ 1 0 0 9 2

Code Number: 1 1 2 0 2 3 0 4 5 2 1 1 2 2 1 1

Location: *Atlanta, Georgia - Forsyth, Georgia*

Data type *1212 hourly medians*, Distance *80.4* km, h_{rs} *190.5* m-msl

N_s *334* N-units, a *9106* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *59.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *51* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	622.4	199.6
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		3.6
elevation [m-msl]		207.3
elevation angle [deg]		
Location, latitude	33°45'51.8"N	33°09'11"N
longitude	84°21'42.1"W	83°53'48"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.31

Figure 51. Path 10092, parameters.

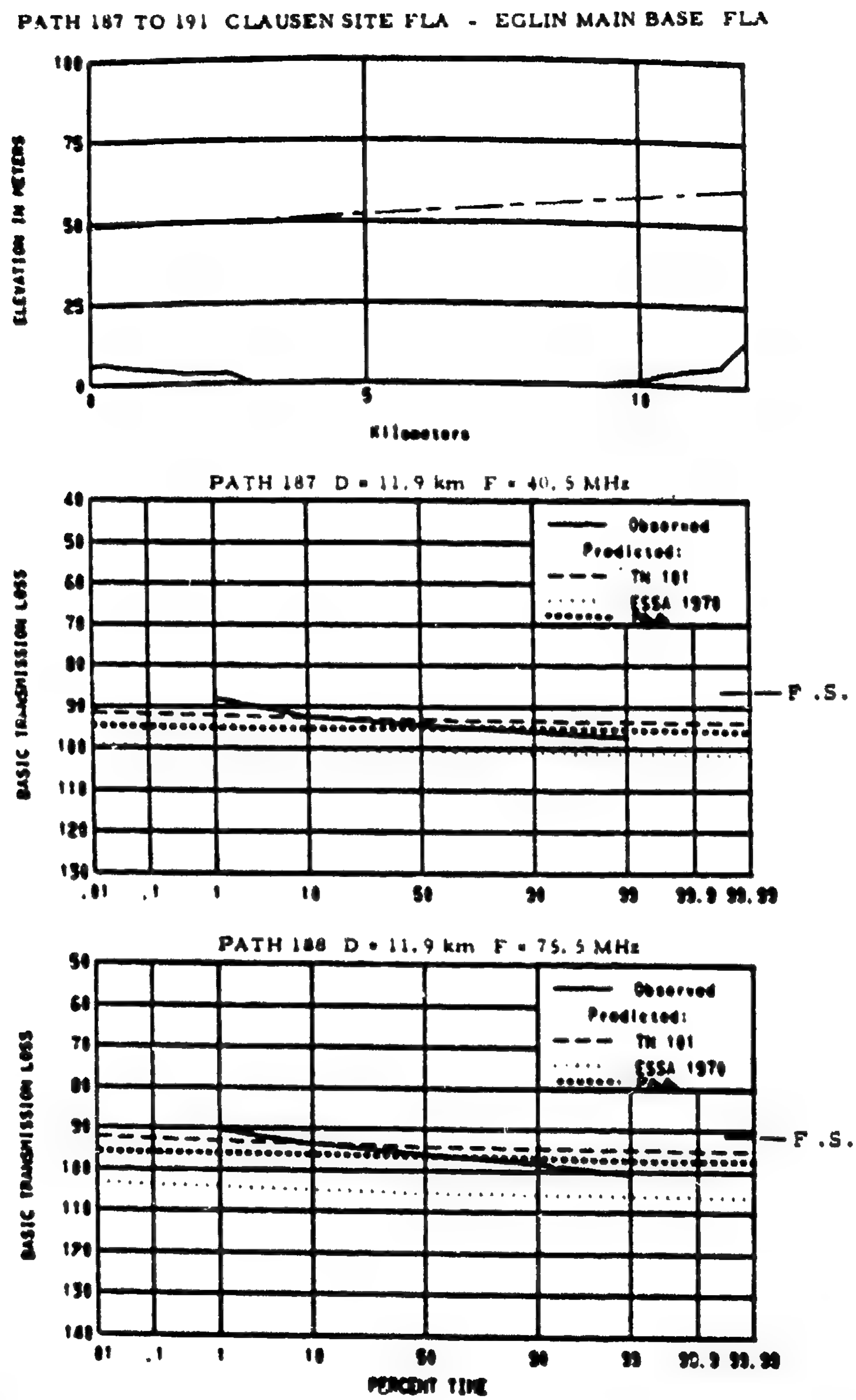


Figure 52. Paths 10187 and 10188, profile and predictions.

Path Number: _ _ _ 1 0 1 8 7

Code Number: 1 1 2 0 1 0 0 4 5 3 1 1 2 3 1 1

Location: *Clausen, Florida - Eglin Main Base, Florida*

Data type *775 hourly medians*, Distance *11.9* km, h_{rs} *0* m-msl

N_s *330* N-units, a *9021* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *40.5* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	49.1	60.9
gain [dBi], main beam		
height [m], above site surface	43.6	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	30°23'3.3"N	30°28'33"N
longitude	86°26'51.3"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.1

Figure 53. Path 10187, parameters.

Path Number: _ _ _ 1 0 1 8 8

Code Number: 1 1 2 0 1 0 0 4 5 3 1 1 2 3 1 1

Location: *Clausen, Florida - Eglin Main Base, Florida*

Data type *775 hourly medians*, Distance *11.4* km, h_{rs} *0* m-msl

N_s *330* N-units, a *9021* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *75.5* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, H ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	46.0	58.2
gain [dBi], main beam		
height [m], above site surface	40.5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	30°23'3.3"N	30°28'33"N
longitude	86°26'51.3"W	86°30'45"W
Path bearing		
elevation [m-msl]		
Other information.		

OT/TRER 16, fig. 1.1

Figure 54. Path 10188, parameters.

CLAUSEN SITE FLA - EGLIN MAIN BASE FLA

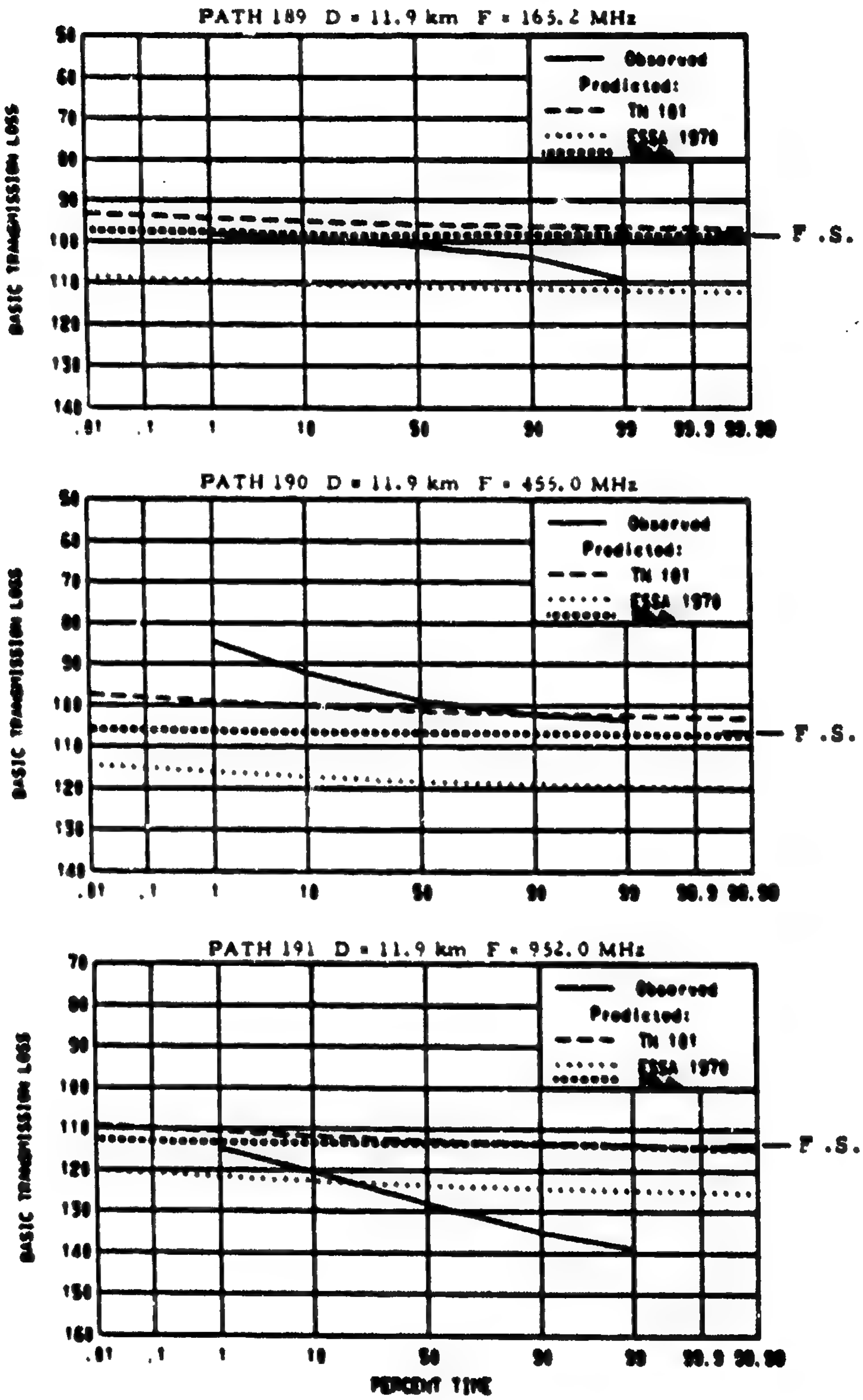


Figure 55. Paths 10189 through 10191, predictions. (see Figure 52 for profile)

Path Number: _ _ _ 1 0 1 8 9

Code Number: 1 1 2 1 1 0 0 4 5 3 1 1 2 3 1 1

Location: *Clausen, Florida - Eglin Main Base, Florida*

Data type *75% hourly medians*, Distance *11.9* km, h_{rs} *0* m-msl

N_s *330* N-units, a *9021* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *165.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	43.0	55.4
gain [dBi], main beam		
height [m], above site surface	37.5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	30°23'3.3"N	30°28'33"N
longitude	86°26'51.3"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.2

Figure 56. Path 10189, parameters.

Path Number: _ _ _ 1 0 1 9 0

Code Number: 1 1 2 4 1 0 0 4 5 3 1 1 2 3 1 1

Location: Clausen, Florida - Eglin Main Base, Florida

Data type 772 hourly medians, Distance 11.9 km, h_{rs} 0 m-msl

N_s 330 N-units, a 9021 km, Surface type sea water

Climate maritime temperate oversea, de ______ km

Frequency 455 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 0 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	41.5	53.9
gain [dBi], main beam		
height [m], above site surface	36.0	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	30°23'3.3"N	30°28'33"N
longitude	86°26'51.3"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.2

Figure 57. Path 10190, parameters.

Path Number: _ _ _ 1 0 1 9 1

Code Number: 1 1 2 9 1 0 0 4 5 3 1 1 2 3 1 1

Location: *Clausen, Florida - Eglin Main Base, Florida*

Data type *757 hourly medians*, Distance *11.9* km, h_{rs} *0* m-msl

N_s *330* N-units, a *9021* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ____ km

Frequency *952* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	40.6	52.4
gain [dBi], main beam		
height [m], above site surface	35.1	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	30°23'3.3"N	30°28'33"N
longitude	86°26'51.3"W	86°30'45"W
Path bearing		
elevation [m-msl]		
Other information:		

OT/TRER 16, fig. 1.2

Figure 58. Path 10191, parameters.

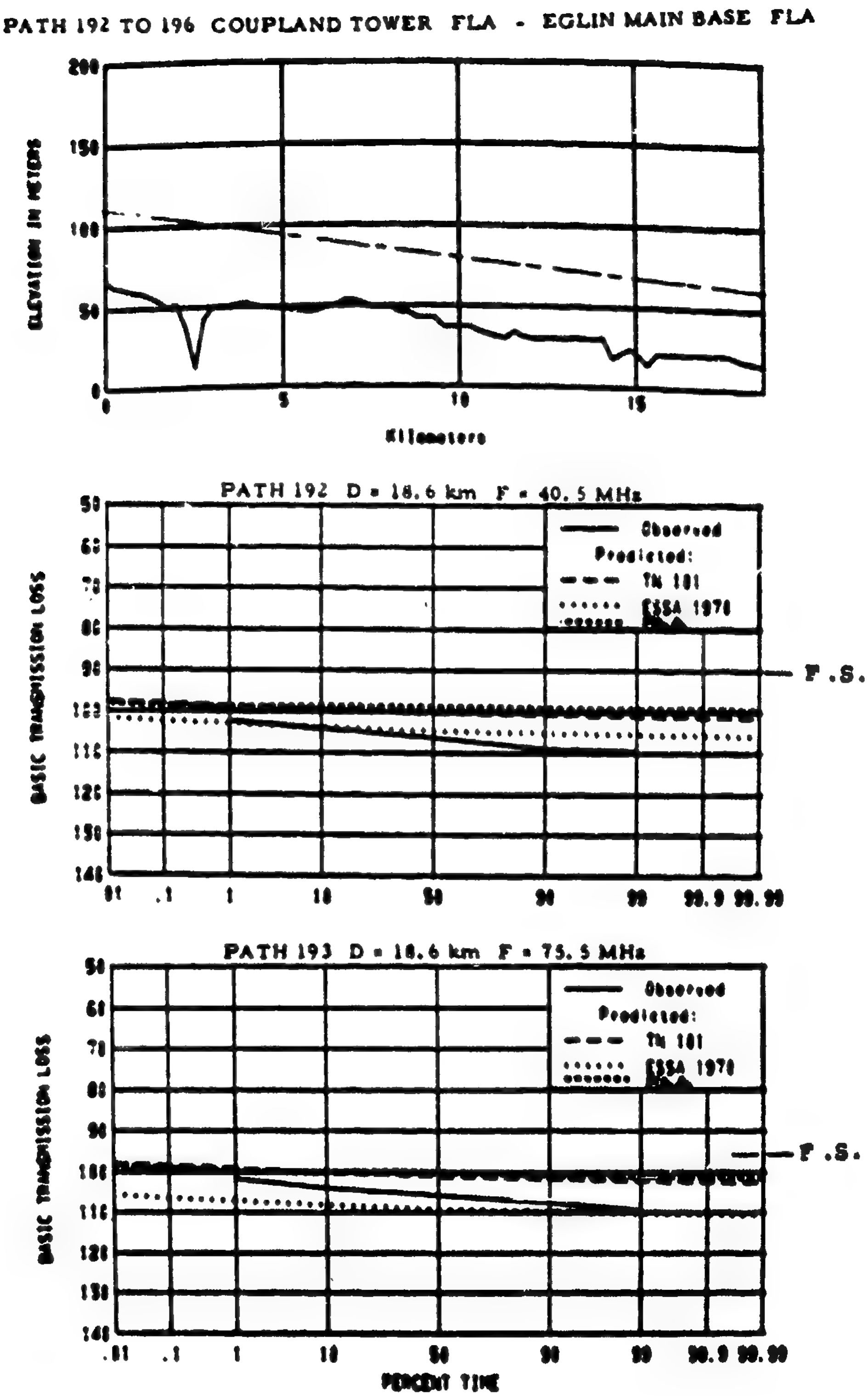


Figure 59. Paths 10192 and 10193, profile and predictions.

Path Number: _ _ _ 1 0 1 9 2

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Coupland, Florida - Eglin Main Base, Florida*

Data type *771 hourly medians*, Distance *18.6* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *40.5* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *23* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	110.7	60.9
gain [dBi], main beam		
height [m], above site surface		46.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		18.6
elevation [m-msl]		67.1
elevation angle [deg]		
Location, latitude	30°35'29.2"N	30°28'33"N
longitude	86°39'10.5"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.3

Figure 60. Path 10192, parameters.

Path Number: _ _ _ 1 0 1 9 3

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Coupland, Florida - Eglin Main Base, Florida*

Data type *774 hourly medians*, Distance *18.6* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *75.5* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *23* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	107.6	58.2
gain [dBi], main beam		
height [m], above site surface		43.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		18.6
elevation [m-msl]		67.1
elevation angle [deg]		
Location, latitude	30°35'29.2"N	30°28'33"N
longitude	86°39'10.5"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.3

Figure 61. Path 10193, parameters.

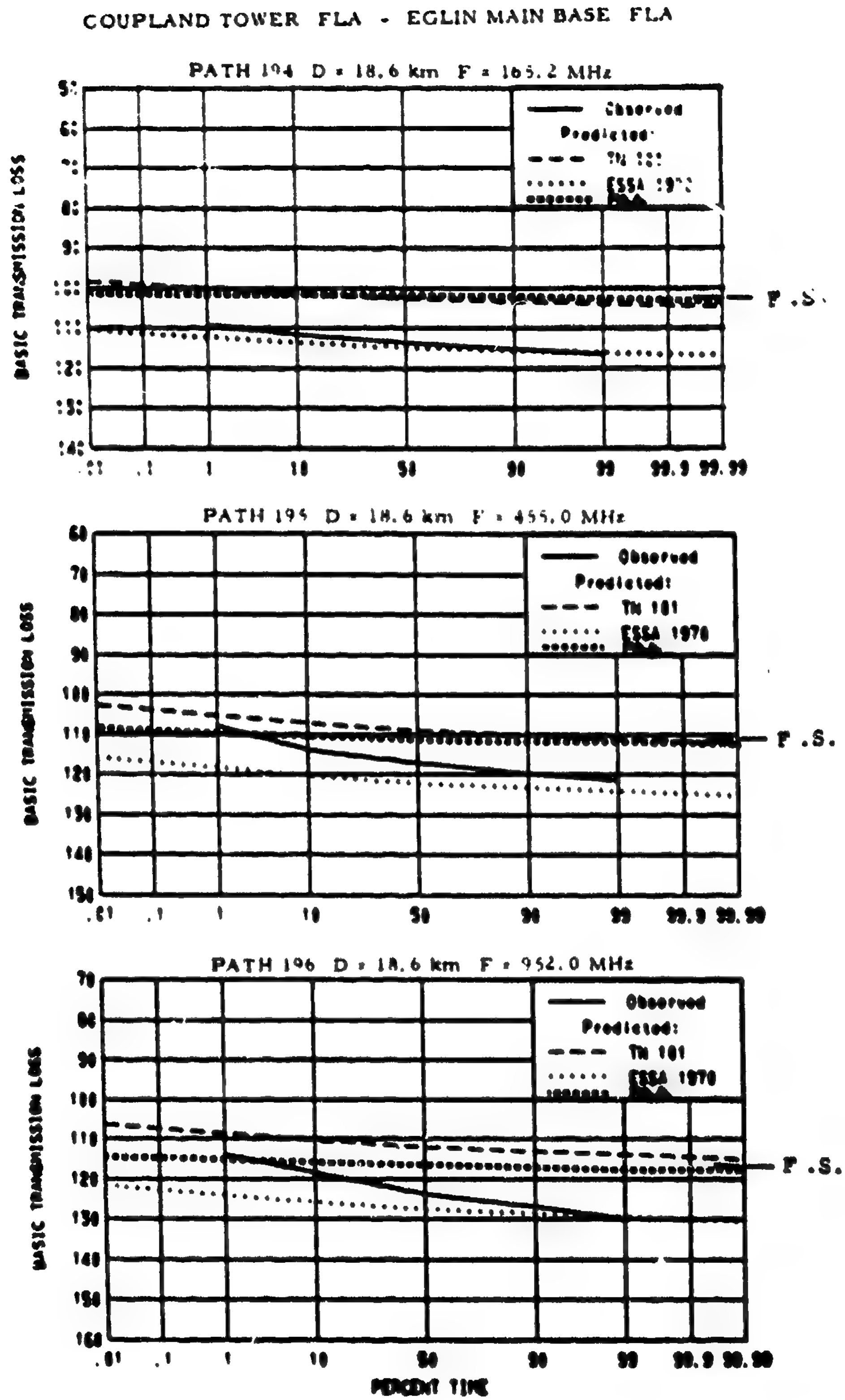


Figure 62. Paths 10194 through 10196, predictions. (see Figure 59 for profile)

Path Number: _ _ _ 1 0 1 9 4

Code Number: 1 1 2 1 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Coupland, Florida - Eglin Main Base, Florida*

Data type *774 hourly medians*, Distance *18.6* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *165.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *23* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	104.6	55.4
gain [dBi], main beam		
height [m], above site surface		41.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		18.6
elevation [m-msl]		67.1
elevation angle [deg]		
Location, latitude	30°35'29.2"N	30°28'33"N
longitude	86°39'10.5"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.4

Figure 63. Path 10194, parameters.

Path Number: 1 0 1 9 5

Code Number: 1 1 2 4 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Coupland, Florida - Eglin Main Base, Florida*

Data type *759 hourly medians*, Distance *18.6* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de km

Frequency *455* MHz, Transmitter output dBW, EIRP dBW

Δh *23.0* m, σ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	*103.1*	*53.9*
gain [dBi], main beam		
height [m], above site surface		*39.6*
line loss [dB]		
polarization	*H*	*H*
type		
Horizon distance [km]		*18.6*
elevation [m-msl]		*67.1*
elevation angle [deg]		
Location, latitude	*30°35'29.2"N*	*30°28'33"N*
longitude	*86°39'10.5"W*	*86°30'45"W*
Path bearing		
elevation [m-msl]		
Other information.		

OT/TRER 16, fig. 1.4

Figure 64. Path 10195, parameters.

Path Number: _ _ _ 1 0 1 9 6

Code Number: 1 1 2 9 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Coupland, Florida - Eglin Main Base, Florida*

Data type *773 hourly medians*, Distance *18.6* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *952* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *23* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	*102.2*	*52.4*
gain [dBi], main beam		
height [m], above site surface		*38.1*
line loss [dB]		
polarization	*H*	*H*
type		
Horizon distance [km]		*18.6*
elevation [m-msl]		*67.1*
elevation angle [deg]		
Location, latitude	*30°35'29.2"N*	*30°28'33"N*
longitude	*86°39'10.5"W*	*86°30'45"W*
Path bearing		
elevation [m-msl]		

Other information.

OT/TRER 16, fig. 1.4

Figure 65. Path 10196, parameters.

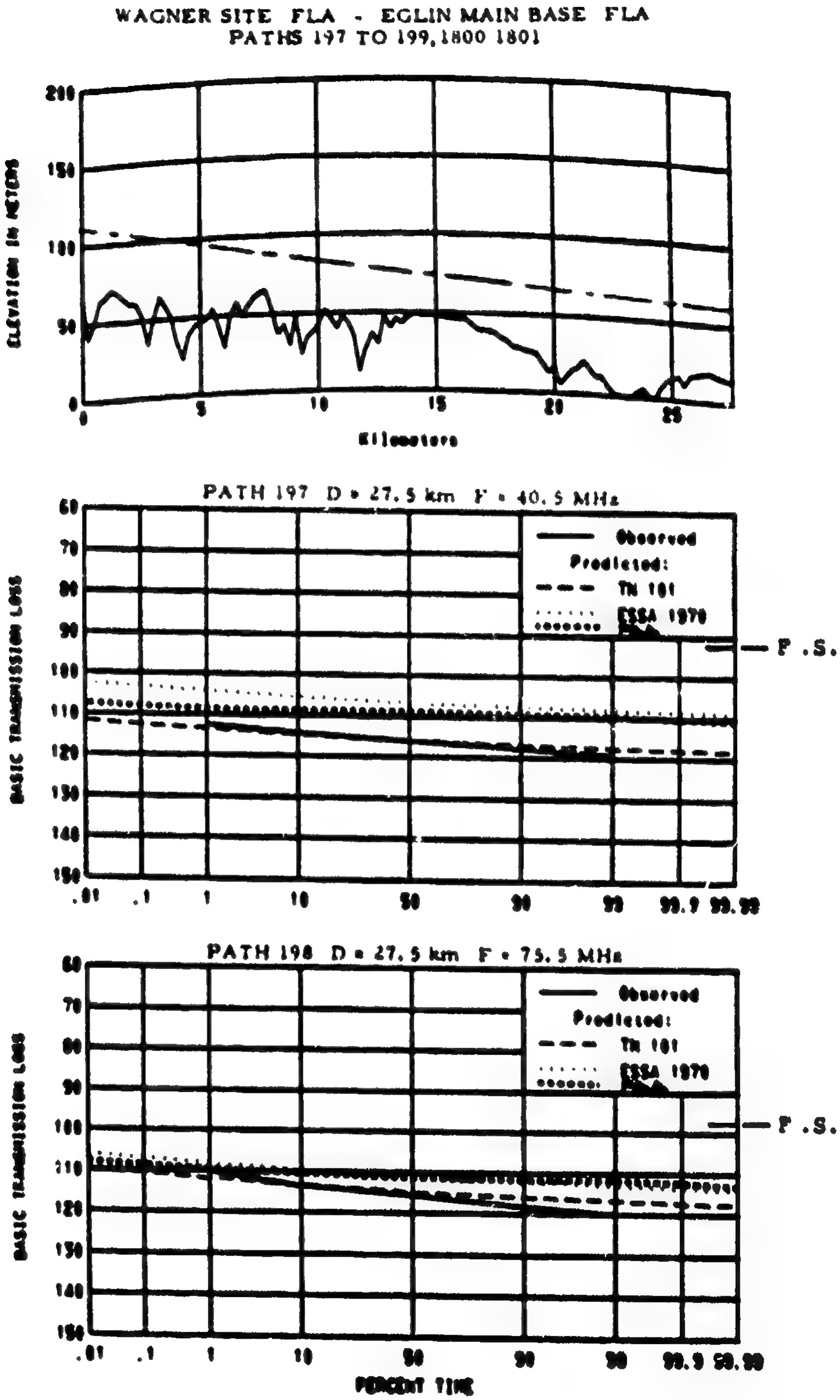


Figure 66. Paths 10197 and 10198, profile and predictions.

Path Number: _ _ _ 1 0 1 9 7

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Wagner, Florida - Eglin Main Base, Florida*

Data type *772 hourly medians*, Distance *27.5* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *40.5* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *53* m, σ ____ m.

	Transmitter	Receiver
Antenna elevation [m-msl]	111.3	60.9
gain [dBi], main beam		
height [m], above site surface		46.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		19.6
elevation [m-msl]		61.
elevation angle [deg]		
Location, latitude	30°40'25.5"N	30°28'33"N
longitude	86°20'21"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.5

Figure 67. Path 10197, parameters.

Path Number: 1 0 1 9 8

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Wagner, Florida - Eglin Main Base, Florida*

Data type *763 hourly medians*, Distance *27.5* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ___ km

Frequency *75.5* MHz, Transmitter output ___ dBW, EIRP ___ dBW

Δh *53* m, θ ___ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	104.0	58.2
gain [dBi], main beam		
height [m], above site surface		43.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		19.6
elevation [m-msl]		61.
elevation angle [deg]		
Location, latitude	30°40'25.5"N	30°28'33"N
longitude	86°20'21"W	86°30'45"W
Path bearing		
elevation [m-msl]		
Other information.		

OT/TRER 16, fig. 1.5

Figure 68. Path 10198, parameters.

WAGNER SITE FLA - EGLIN MAIN BASE FLA

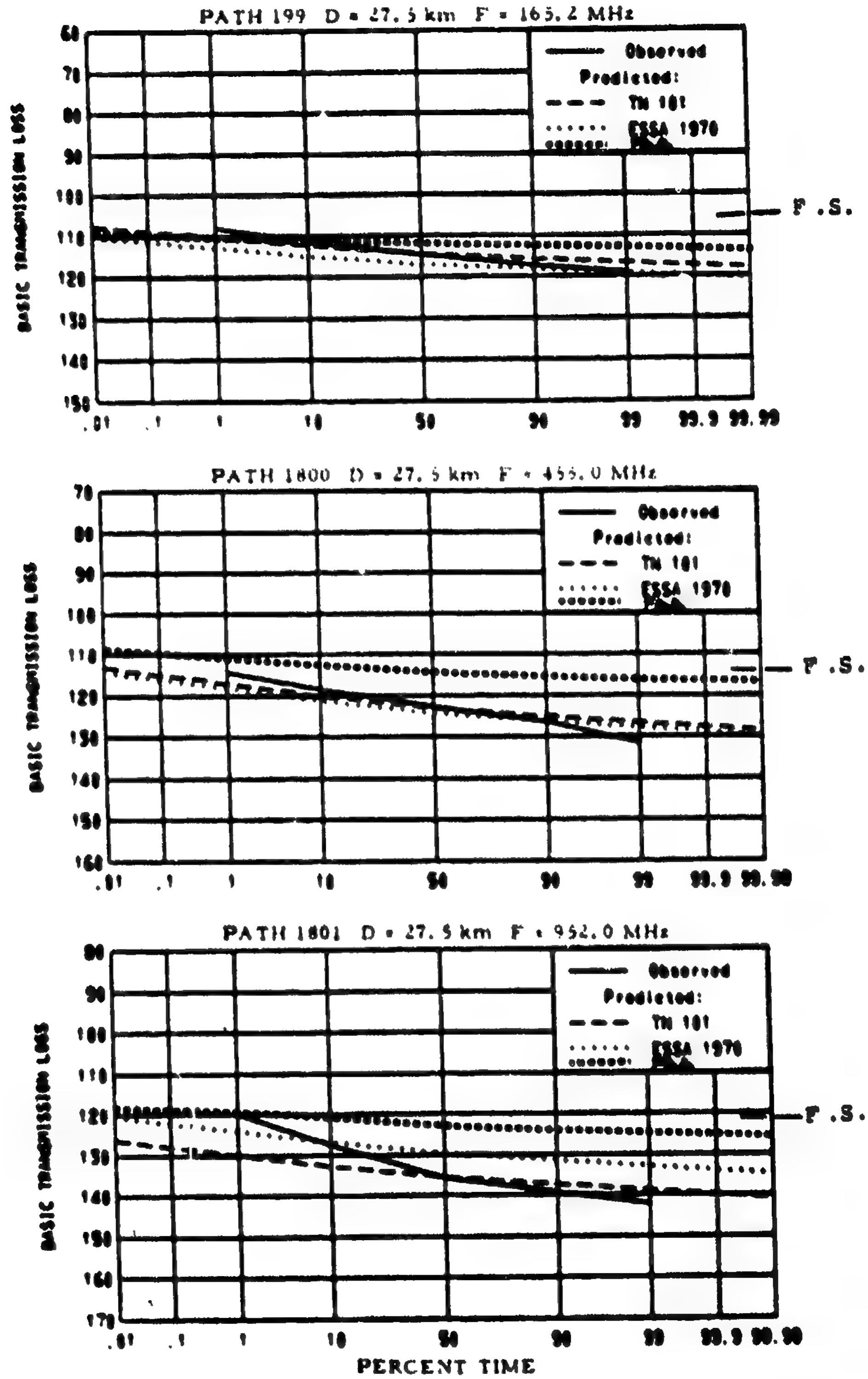


Figure 69. Paths 10199, 11800, and 11801, predictions.
(see Figure 66 for profile)

Path Number: _ _ _ 1 0 1 9 9

Code Number: 1 1 2 1 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Wagner, Florida - Eglin Main Base, Florida*

Data type *778 hourly medians*, Distance *27.5* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *165.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *53* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	100.9	55.4
gain [dBi], main beam		
height [m], above site surface		41.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		19.6
elevation [m-msl]		61.
elevation angle [deg]		
Location, latitude	30°40'25.5"N	30°28'33"N
longitude	86°20'21"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.6

Figure 70. Path 10199, parameters.

Path Number: _ _ _ 1 1 8 0 0

Code Number: 1 1 2 4 1 0 0 4 5 2 1 1 2 3 1 1

Location: Wagner, Florida - Eglin Main Base, Florida

Data type 769 hourly medians, Distance 27.5 km, h_{rs} 14.3 m-msl

N_s 330 N-units, a 9021 km, Surface type average ground

Climate continental temperate, de ______ km

Frequency 455 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 53 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	99.4	53.9
gain [dBi], main beam		
height [m], above site surface		39.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		19.6
elevation [m-msl]		61.
elevation angle [deg]		
Location, latitude	30°40'25.5"N	30°28'33"N
longitude	86°20'21"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.6

Figure 71. Path 11800, parameters.

Path Number: _ _ _ 1 1 8 0 1

Code Number: 1 1 2 9 1 0 0 4 5 2 1 1 2 3 1 1

Location: *Wagner, Florida - Eglin Main Base, Florida*

Data type *764 hourly medians*, Distance *27.5* km, h_{rs} *14.3* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *952* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *53* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	98.2	52.4
gain [dBi], main beam		
height [m], above site surface		38.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		19.6
elevation [m-msl]		61.
elevation angle [deg]		
Location, latitude	30°40'25.5"N	30°28'33"N
longitude	86°20'21"W	86°30'45"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.6

Figure 72. Path 11801, parameters.

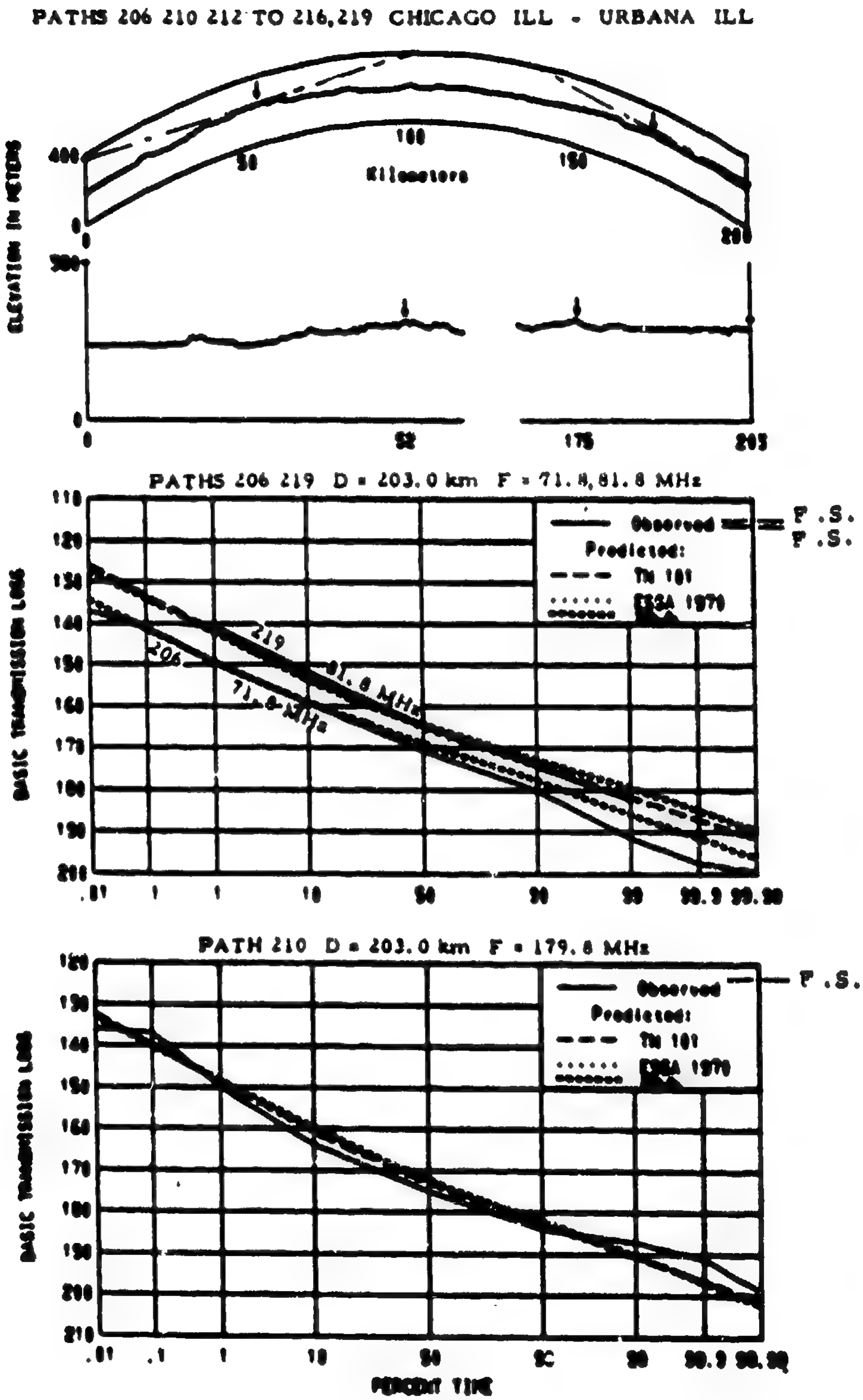


Figure 73. Paths 10206, 10219, and 10210, profile and predictions.

Path Number: 1 0 2 0 6

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Chicago, Illinois - Urbana, Illinois*

Data type *9304 hourly medians*, Distance *203.4* km, h_{rs} *200* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ___ km

Frequency *71.8* MHz, Transmitter output ___ dBW, EIRP ___ dBW

Δh *36* m, θ ___ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	380.1	246.9
gain [dBi], main beam		
height [m], above site surface		27.4
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		28.5
elevation [m-msl]		246.3
elevation angle [deg]		
Location, latitude	41°53'09"N	40°06'39"N
longitude	87°37'56"W	88°13'41"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.17

Figure 74. Path 10206, parameters.

Path Number: _ _ _ 1 0 2 1 9

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Chicago, Illinois - Urbana, Illinois*

Data type *2711 hourly medians*, Distance *203.0* km, h_{rs} *238.7* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *81.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *34* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	363.7	253.0
gain [dBi], main beam		
height [m], above site surface		33.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		28.5
elevation [m-msl]		246.9
elevation angle [deg]		
Location, latitude	41°52'57.4"N	40°06'39"N
longitude	87°38'15"W	88°13'41"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.17

Figure 75. Path 10219, parameters.

Path Number: _ _ _ 1 0 2 1 0

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Chicago, Illinois - Urbana, Illinois*

Data type *9226 hourly medians*, Distance *203.0* km, h_{rs} *200* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *179.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *36* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	*374.0*	*246.9*
gain [dBi], main beam		
height [m], above site surface		*27.4*
line loss [dB]		
polarization	*H*	*H*
type		
Horizon distance [km]		*28.5*
elevation [m-msl]		*246.9*
elevation angle [deg]		
Location, latitude	*41°52'57.4"N*	*40°06'39"N*
longitude	*87°38'15"W*	*88°13'41"W*
Path bearing		
elevation [m-msl]		

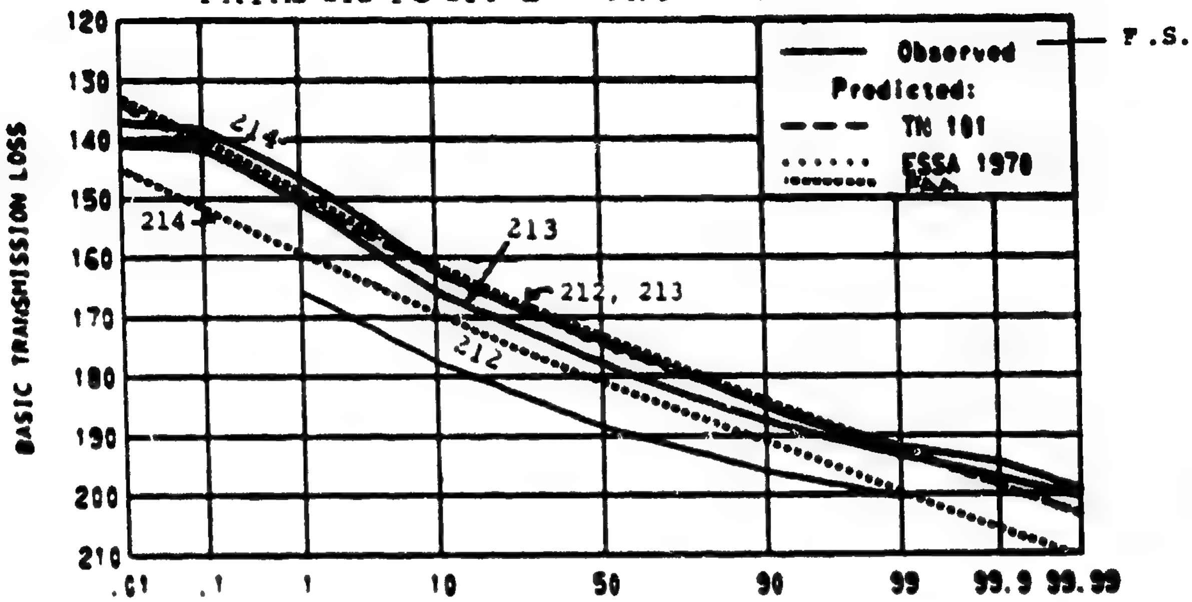
Other information:

OT/TRER 16, fig. 3.17

Figure 76. Path 10210, parameters.

CHICAGO ILL - URBANA ILL

PATHS 212 TO 214 D = 204.1 km F = 191.8 MHz



PATHS 215 216 D = 204.1 km F = 191.8 MHz

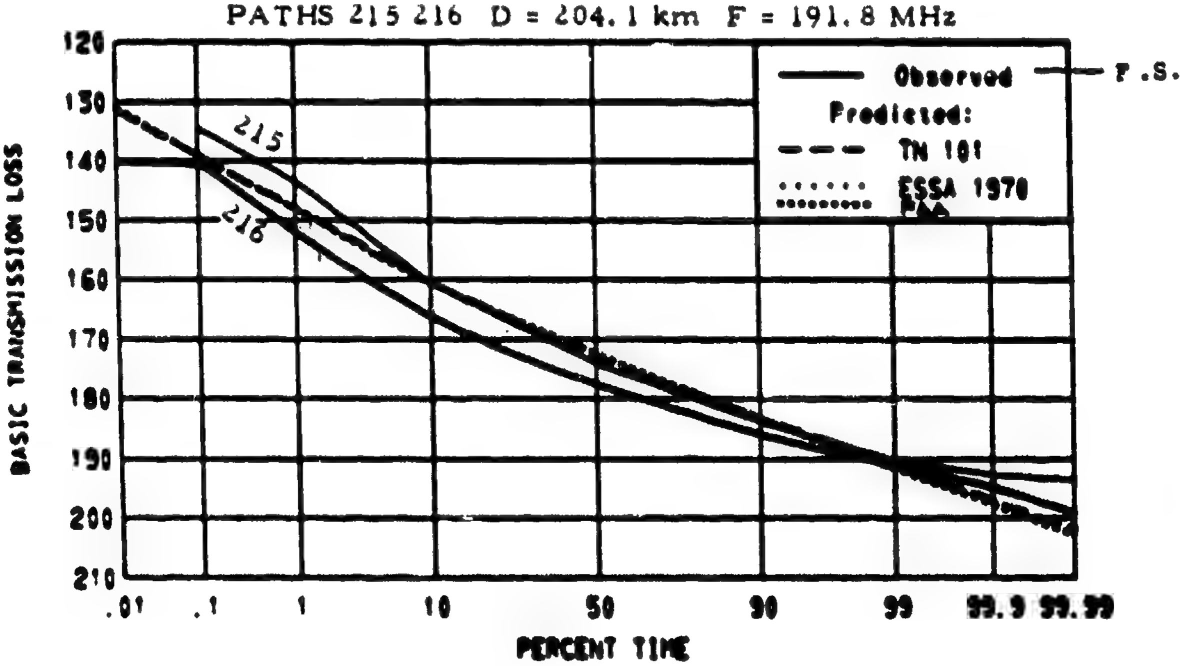


Figure 77. Paths 10212 through 10216, predictions. (see Figure 73 for profile)

Path Number: _ _ _ 1 0 2 1 2

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Chicago, Illinois - Urbana, Illinois*

Data type *3139 hourly medians*, Distance *204.1* km, h_{rs} *200* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ___ km

Frequency *191.8* MHz, Transmitter output ___ dBW, EIRP ___ dBW

Δh *36* m, θ ___ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	365.7	241.4
gain [dBi], main beam		
height [m], above site surface		21.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		28.2
elevation [m-msl]		245.4
elevation angle [deg]		
Location, latitude	41°53'25"N	40°06'39"N
longitude	87°37'25"W	88°13'41"W
Path bearing		
elevation [m-msl]		
Other information.		

OT/TRER 16, fig. 3.18

Figure 78. Path 10212, parameters.

Path Number: _ _ _ 1 0 2 1 3

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Chicago, Illinois - Urbana, Illinois*

Data type *10787 hourly medians*, Distance *204.1* km, h_{rs} *200* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *191.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *36* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	365.7	241.4
gain [dBi], main beam		
height [m], above site surface		21.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		28.2
elevation [m-msl]		245.4
elevation angle [deg]		
Location, latitude	41°53'25"N	40°06'39"N
longitude	87°37'25"W	88°13'41"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.18

Figure 79. Path 10213, parameters.

Path Number: _ _ _ 1 0 2 1 4

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Chicago, Illinois - Urbana, Illinois*

Data type *10777 hourly medians*, Distance *204.1* km, h_{rs} *245.4* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *191.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *36* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	365.7	249.4
gain [dBi], main beam		
height [m], above site surface		29.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		28.2
elevation [m-msl]		245.4
elevation angle [deg]		
Location, latitude	41°53'25"N	40°06'39"N
longitude	87°37'25"W	88°13'41"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.18

Figure 80. Path 10214, parameters.

Path Number: _ _ _ 1 0 2 1 5

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Chicago, Illinois - Urbana, Illinois*

Data type *9831 hourly medians*, Distance *204.1* km, h_{rs} *200* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *191.8* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *36* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	365.7	257
gain [dBi], main beam		
height [m], above site surface		37.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		28.9
elevation [m-msl]		246.3
elevation angle [deg]		
Location, latitude	41°53'25"N	40°06'39"N
longitude	87°37'25"W	88°13'41"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.18

Figure 81. Path 10215, parameters.

Path Number: 1 0 2 1 6

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Chicago, Illinois - Urbana, Illinois*

Data type *10152 hourly medians*, Distance *204.1* km, h_{rs} *200* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *191.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *36* m, σ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	365.7	241.4
gain [dBi], main beam		
height [m], above site surface		21.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		28.2
elevation [m-msl]		245.4
elevation angle [deg]		
Location, latitude	41°53'25"N	40°06'39"N
longitude	87°37'25"W	88°13'41"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.18

Figure 82. Path 10216, parameters.

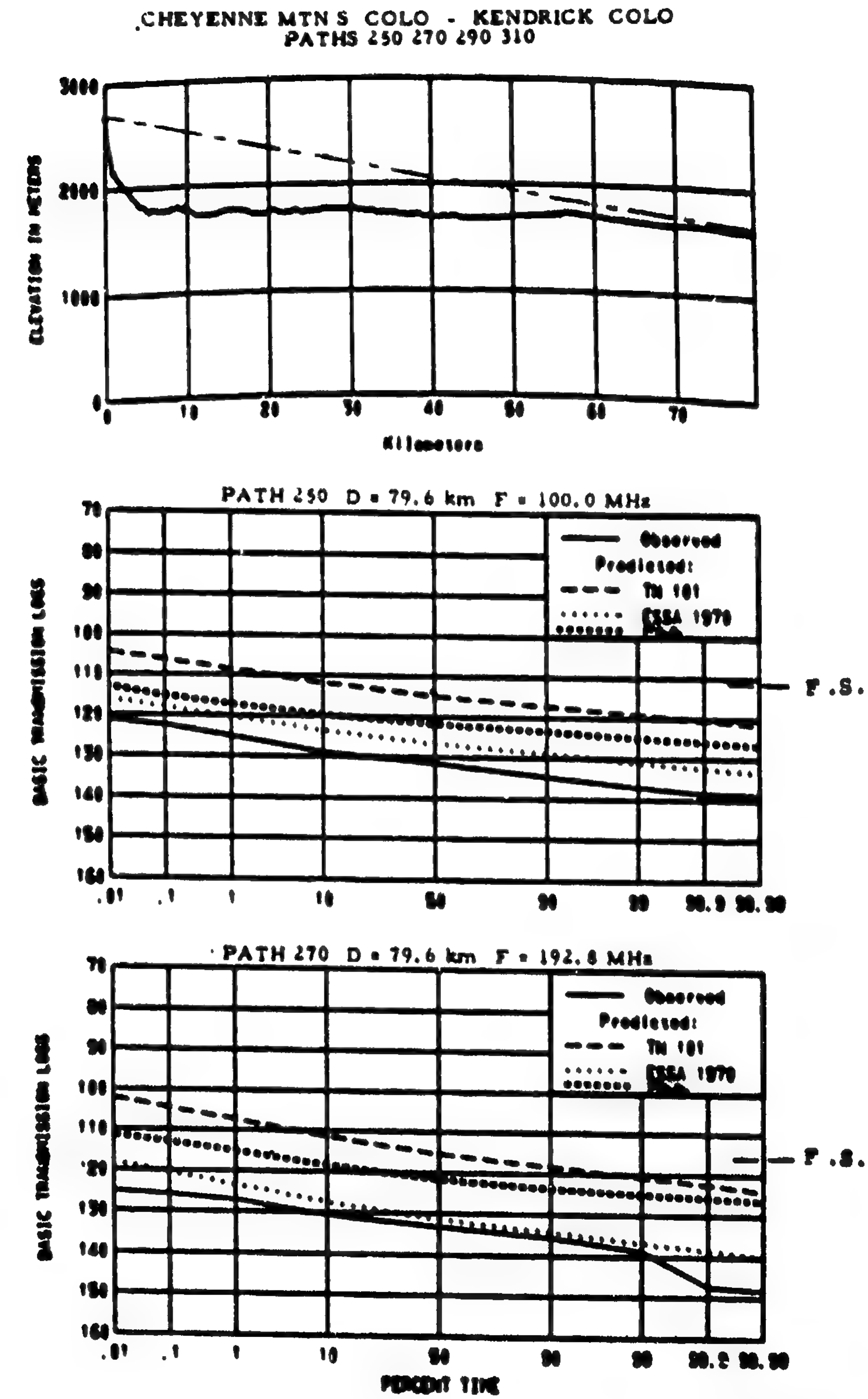


Figure 83. Paths 10250 and 10270, profile and predictions.

Path Number: _ _ _ 1 0 2 5 0

Code Number: 1 1 2 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Kendrick, Colorado*

Data type *9628 hourly medians*, Distance *79.6* km, h_{rs} *1603* m-msl

N_s *248* N-units, a *7826* km, Surface type *average ground*

Climate *continental temperate*, de ________ km

Frequency *100.0* MHz, Transmitter output ________ dBW, EIRP ________ dBW

Δh *116* m, θ ________ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2683.8	1609
gain [dBi], main beam		
height [m], above site surface		6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		79.6
elevation [m-msl]		2667.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°34'08.4"N
longitude	104°51'50.4"W	103°59'02.4"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.7

Figure 84. Path 10250, parameters.

Path Number: _ _ _ 1 0 2 7 0

Code Number: 1 1 2 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Kendrick, Colorado*

Data type *5835 hourly medians*, Distance *79.6* km, h_{rs} *1605* m-msl

N_s *248* N-units, a *7826* km, Surface type *average ground*

Climate *continental temperate*, de ___ km

Frequency *192.8* MHz, Transmitter output ___ dBW, EIRP ___ dBW

Δh *116* m, θ ___ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2699	1608.7
gain [dBi], main beam		
height [m], above site surface		5.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		79.6
elevation [m-msl]		2667.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°34'08.4"N
longitude	104°51'50.4"W	103°59'02.4"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.7

Figure 85. Path 10270, parameters.

CHEYENNE MTN S COLO - KENDRICK COLO

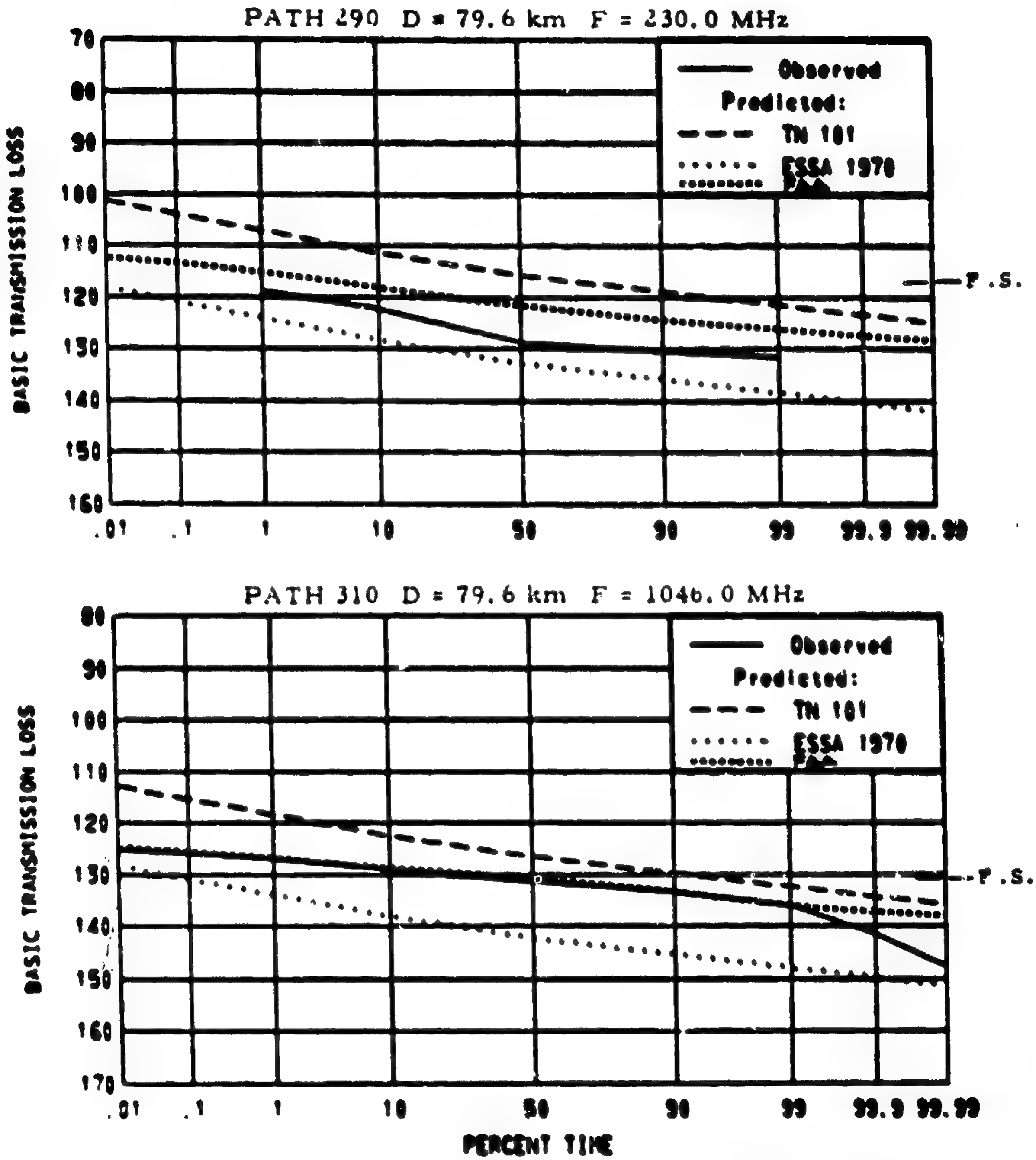


Figure 86. Paths 10290 and 10310, predictions.
(see Figure 83 for profile)

Path Number: _ _ _ 1 0 2 9 0

Code Number: 1 1 2 2 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Kendrick, Colorado*

Data type *1024 hourly median*, Distance *79.6* km, h_{rs} *1603* m-msl

N_s *248* N-units, a *7826* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *230* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *116* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2699	1608.7
gain [dBi], main beam		
height [m], above site surface		5.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		79.6
elevation [m-msl]		2667.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°34'08.4"N
longitude	104°51'50.4"W	103°59'02.4"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.8

Figure 87. Path 10290, parameters.

Path Number: _ _ _ 1 0 3 1 0

Code Number: 1 1 3 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Kendrick, Colorado*

Data type *7855 hourly medians*, Distance *79.6* km, h_{rs} *1603* m-msl

N_s *248* N-units, a *7826* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *1046* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *116* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670.	1616.3
gain [dBi], main beam		
height [m], above site surface		13.3
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		79.6
elevation [m-msl]		2667.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°34'08.4"N
longitude	104°51'50.4"W	103°59'02.4"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.8

Figure 88. Path 10310, parameters.

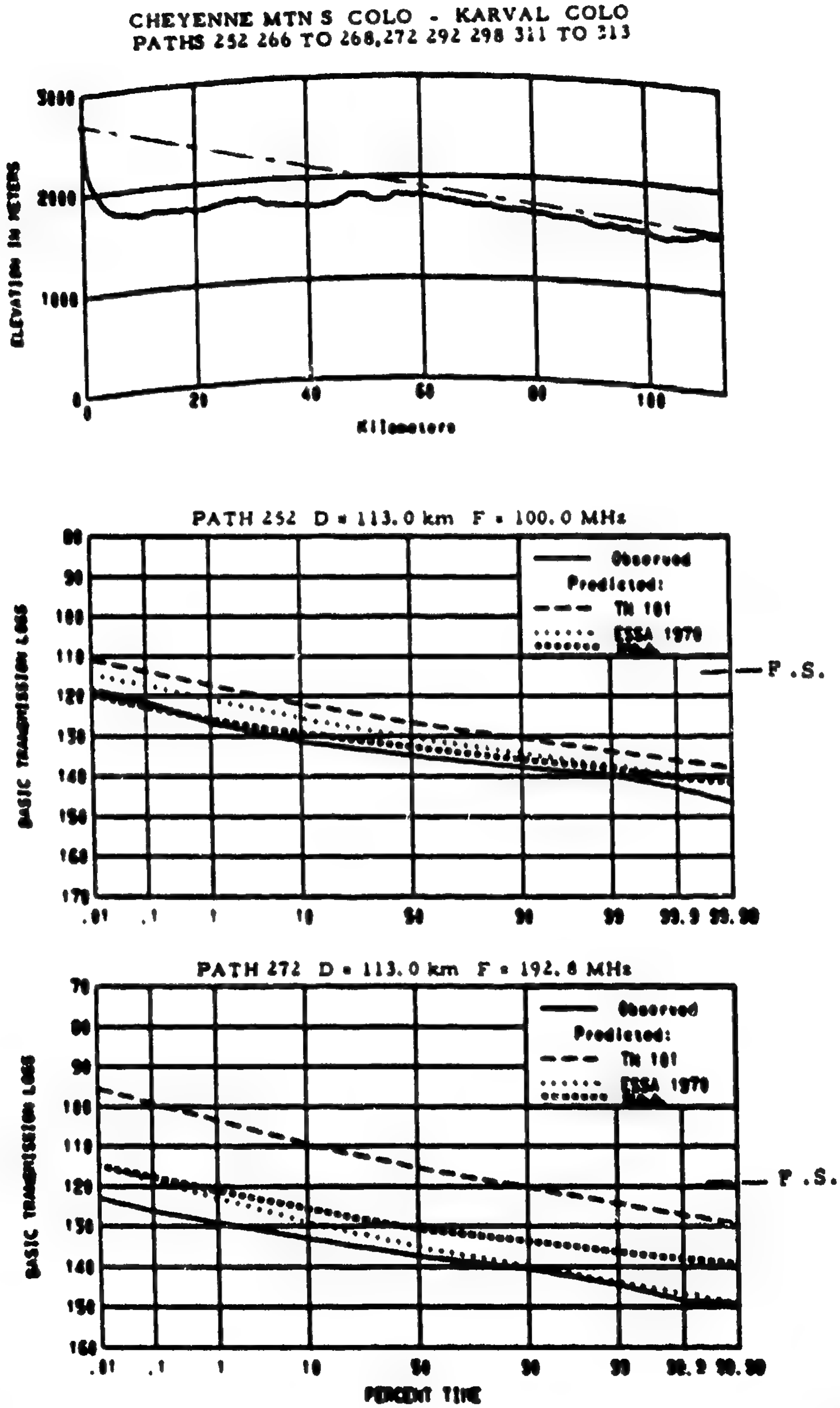


Figure 89. Paths 10252 and 10272, profile and predictions.

Path Number: _ _ _ 1 0 2 5 2

Code Number: 1 1 2 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *11782 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *100* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *187* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2683.8	1548.1
gain [dBi], main beam		
height [m], above site surface		6.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.43
elevation [m-msl]		1817.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.11

Figure 90. Path 10252, parameters.

Path Number: _ _ _ 1 0 2 7 2

Code Number: 1 1 2 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *6967 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *192.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *187* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2699	1547.8
gain [dBi], main beam		
height [m], above site surface		6.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.43
elevation [m-msl]		1817.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.11

Figure 91. Path 10272, parameters.

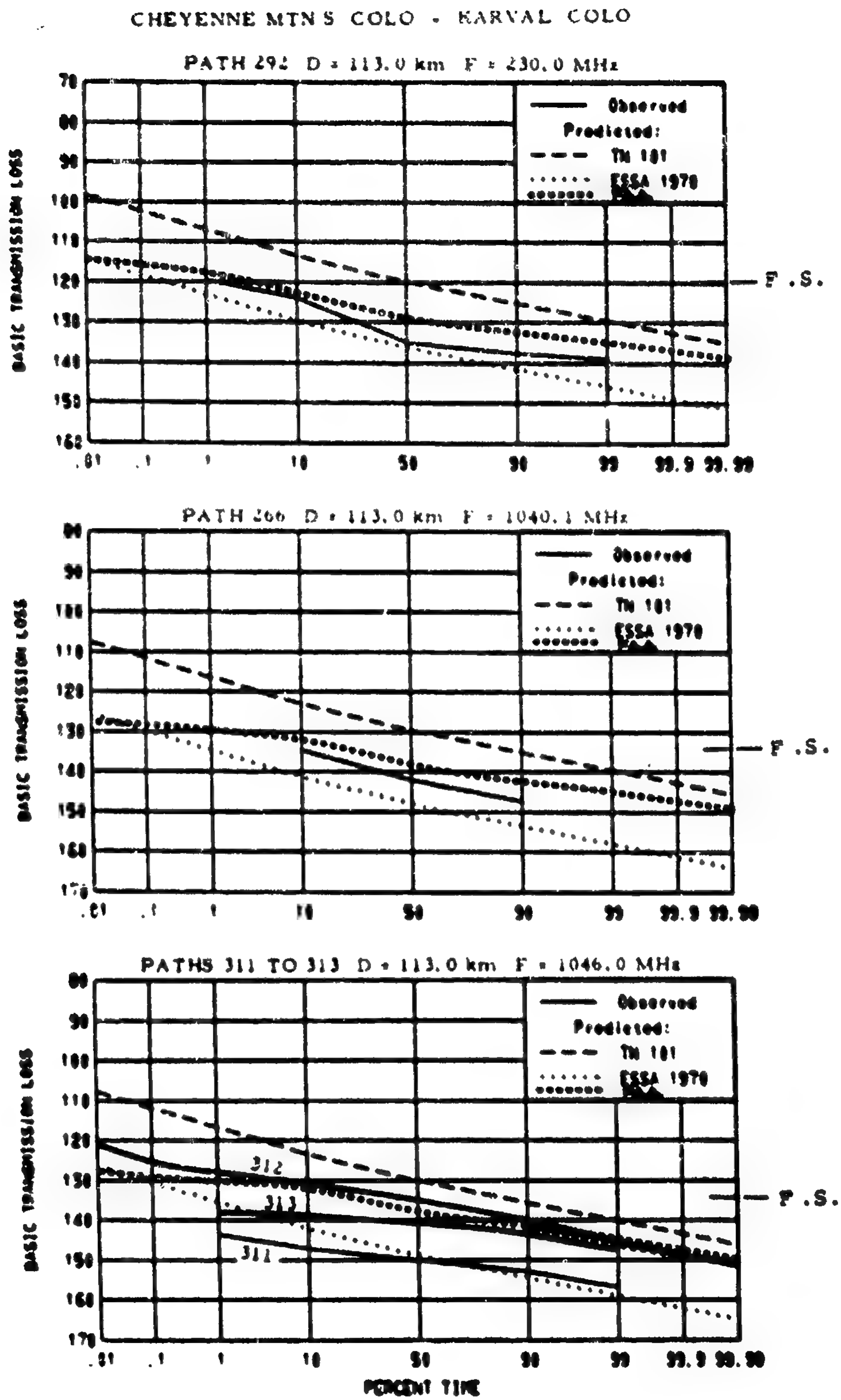


Figure 92. Paths 10292, 10266, and 10311 through 10313, predictions. (see Figure 89 for profile)

Path Number: 1 0 2 9 2

Code Number: 1 1 2 2 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *909 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *230* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *187* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2699	1547.8
gain [dBi], main beam		
height [m], above site surface		5.8
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.43
elevation [m-msl]		1817.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.12

Figure 93. Path 10292, parameters.

Path Number: _ _ _ 1 0 2 6 6

Code Number: 1 1 3 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *232 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *1040.1* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *187* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670	1544.9
gain [dBi], main beam		
height [m], above site surface		2.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.45
elevation [m-msl]		1817.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.12

Figure 94. Path 10266, parameters.

Path Number: _ _ _ 1 0 3 1 1

Code Number: 1 1 3 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *599 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *1046* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *187* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670	1543.8
gain [dBi], main beam		
height [m], above site surface		1.8
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.43
elevation [m-msl]		1817
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.12

Figure 95. Path 10311, parameters.

Path Number: _ _ _ 1 0 3 1 2

Code Number: 1 1 3 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *6132 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *1046* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *187* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670	1555.4
gain [dBi], main beam		
height [m], above site surface		13.4
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.43
elevation [m-msl]		1817
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.12

Figure 96. Path 10312, parameters.

Path Number: _ _ _ 1 0 3 1 3

Code Number: 1 1 3 1 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *405 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *1046* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *187* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670	1546.6
gain [dBi], main beam		
height [m], above site surface		4.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.45
elevation [m-msl]		1817
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.12

Figure 97. Path 10313, parameters.

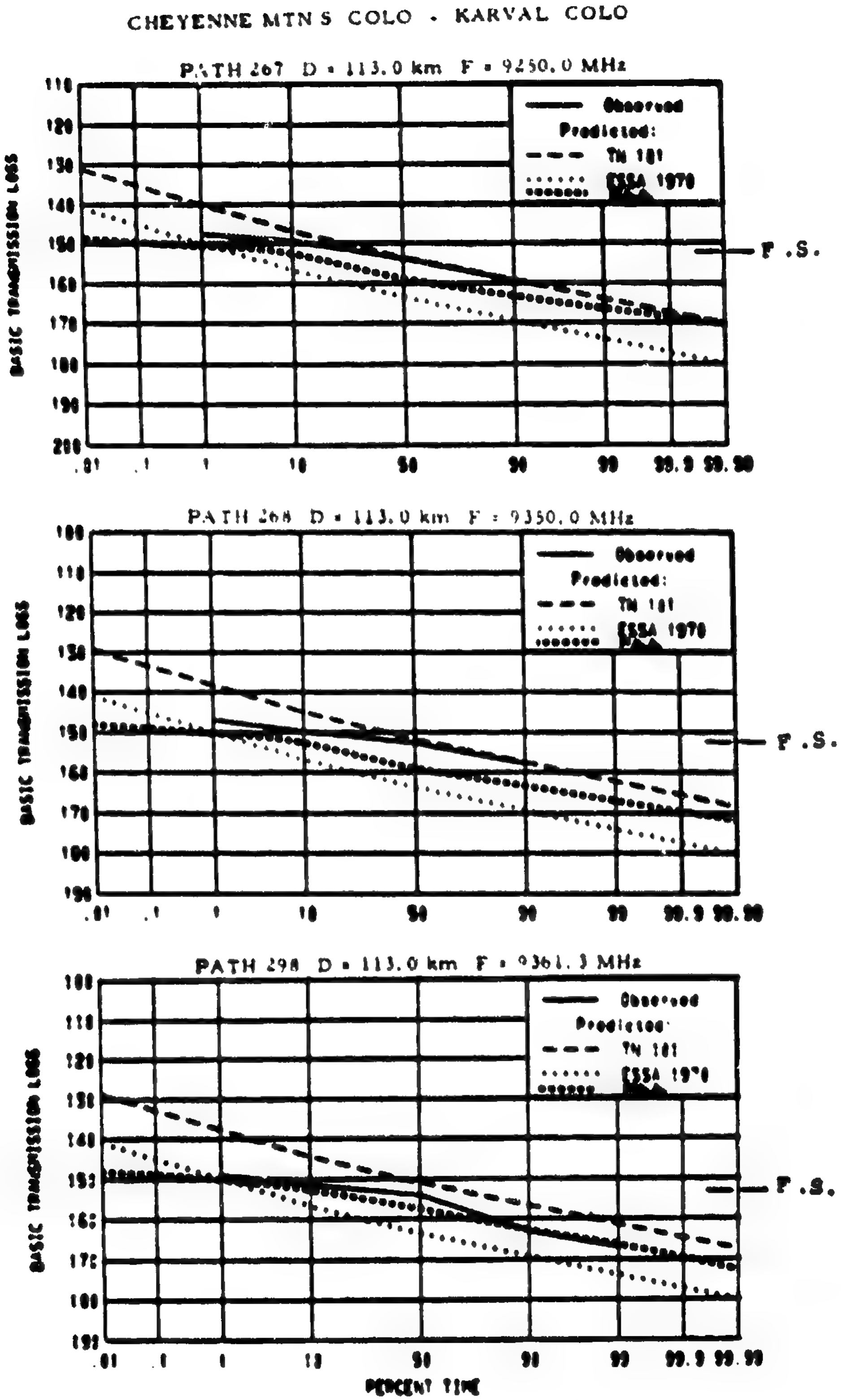


Figure 98. Paths 10267, 10268, and 10298, predictions.
(see Figure 89 for profile)

Path Number: _ _ _ 1 0 2 6 7

Code Number: 1 1 3 9 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *183 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *9250* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *187* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670	1544.9
gain [dBi], main beam		
height [m], above site surface		2.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.43
elevation [m-msl]		1817.
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.13

Figure 99. Path 10267, parameters.

Path Number: _ _ _ 1 0 2 6 8

Code Number: 1 1 3 9 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Karval, Colorado*

Data type *186 hourly mediuns*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *9350* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *187* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670	1544.9
gain [dBi], main beam		
height [m], above site surface		2.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		53.43
elevation [m-msl]		1817
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°37'55.2"N
longitude	104°51'50.4"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OTTRER 16, fig. 1.13

Figure 100. Path 10268, parameters.

Path Number: _ _ _ 1 0 2 9 8

Code Number: 1 1 3 9 1 0 0 4 5 2 1 1 2 8 1 1

Location: *Karval, Colorado - Cheyenne Mountain Summit, Colorado*

Data type *147 hourly medians*, Distance *113.0* km, h_{rs} *1542* m-msl

N_s *250* N-units, a *7846* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *9361.3* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *187* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1545	2668.5
gain [dBi], main beam		
height [m], above site surface	3	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	53.43	
elevation [m-msl]	1817	
elevation angle [deg]		
Location, latitude	38°37'55.2"N	38°45'50.4"N
longitude	103°34'19.2"W	104°51'50.4"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.13

Figure 101. Path 10298, parameters.

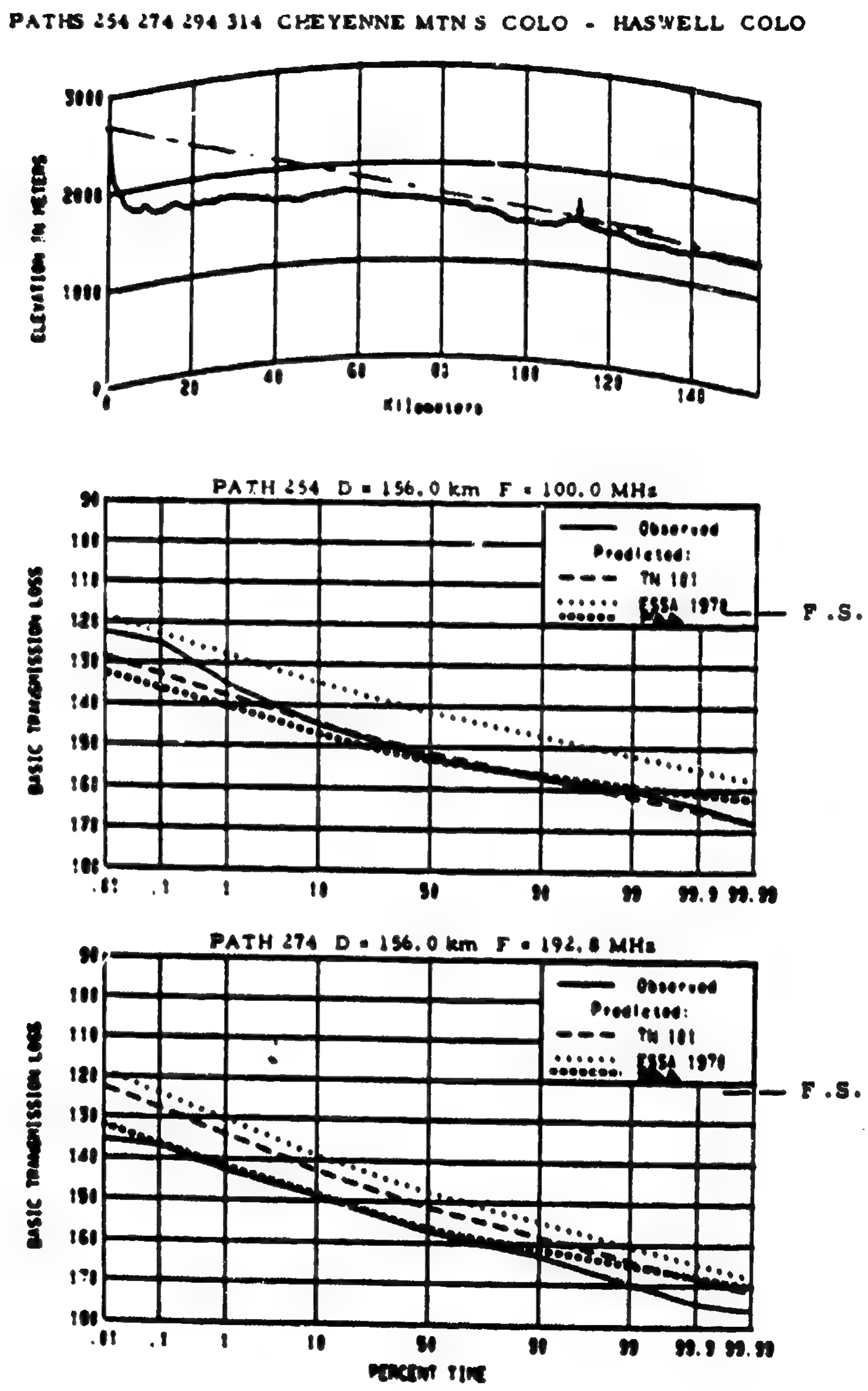


Figure 102. Paths 10254 and 10274, profile and predictions.

Path Number: _ _ _ 1 0 2 5 4

Code Number: 1 1 2 1 2 3 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Haswell, Colorado*

Data type *9999 hourly medians*, Distance *156.0* km, h_{rs} *1334* m-msl

N_s *251* N-units, a *7856* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *100* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *114* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	*2683.8*	*1339.3*
gain [dBi], main beam		
height [m], above site surface		*5.3*
line loss [dB]		
polarization	*H*	*H*
type		
Horizon distance [km]		*43*
elevation [m-msl]		*1487*
elevation angle [deg]		
Location, latitude	*38°45'50.4"N*	*38°22'58.8"N*
longitude	*104°51'50.4"W*	*103°08'27.6"W*
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.33

Figure 103. Path 10254, parameters.

Path Number: _ _ _ 1 0 2 7 4

Code Number: 1 1 2 1 2 3 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Haswell, Colorado*

Data type *6205 hourly medians*, Distance 156.0 km, h_{rs} 1334 m-msl

N_s 251 N-units, a 7856 km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency 192.8 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 114 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2699	1339
gain [dBi], main beam		
height [m], above site surface		5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		43
elevation [m-msl]		1487
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°22'58.8"N
longitude	104°51'50.4"W	103°08'27.6"W
Path bearing		
elevation [m-msl]		

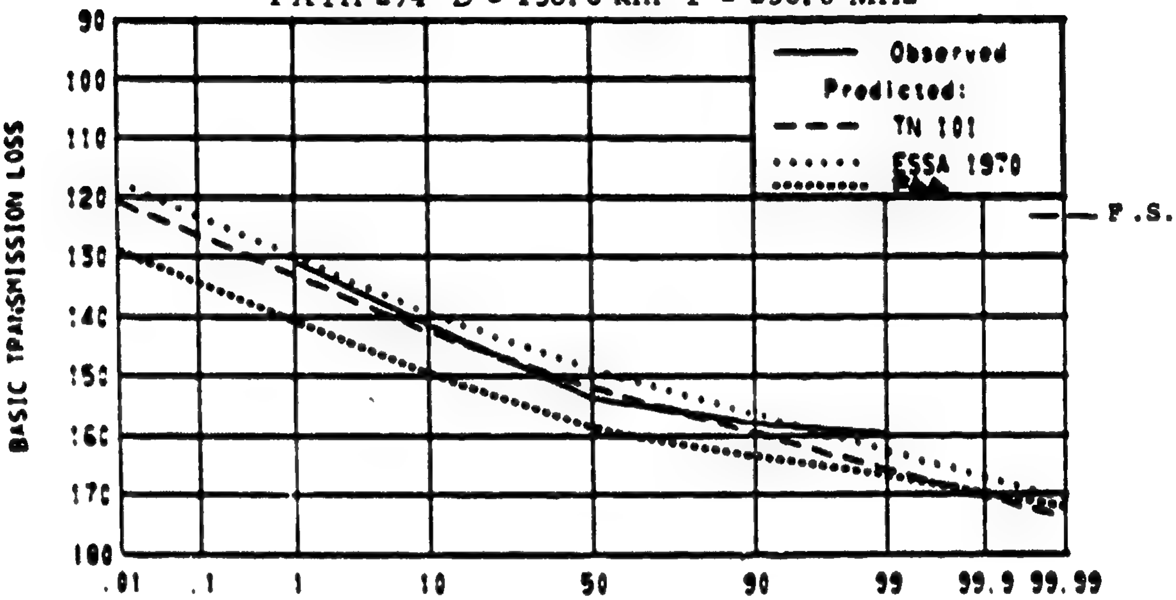
Other information:

OT/TRER 16, fig. 2.33

Figure 104. Path 10274, parameters.

CHEYENNE MTN S COLO - HASWELL COLO

PATH 294 D = 156.0 km F = 230.0 MHz



PATH 314 D = 156.0 km F = 1046.0 MHz

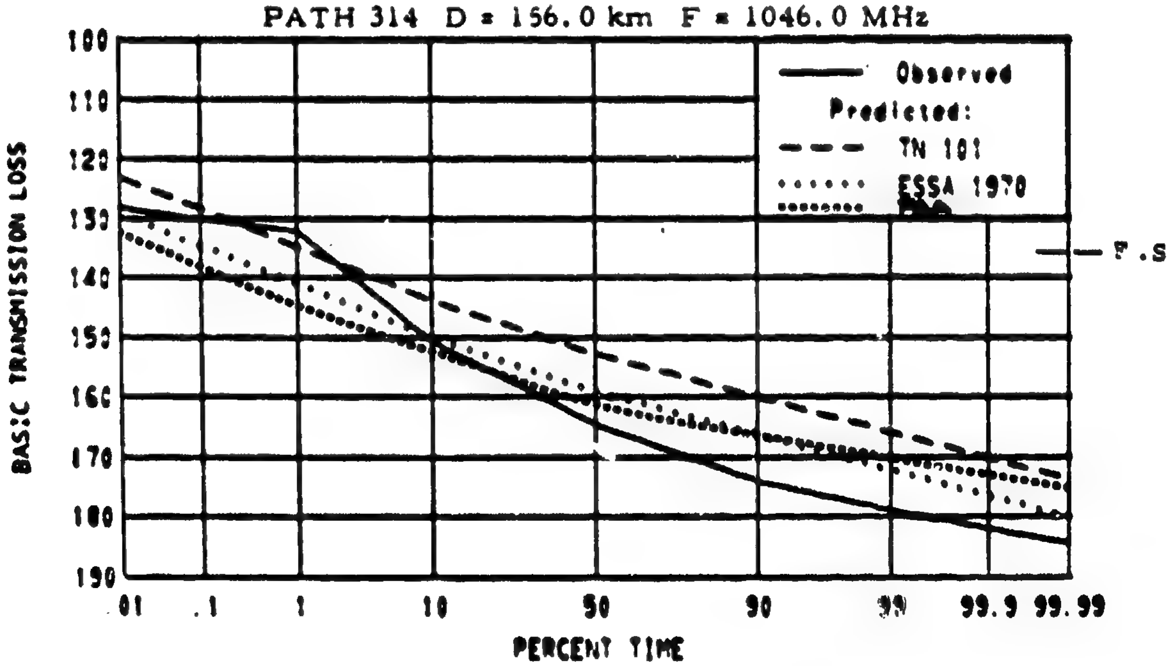


Figure 105. Paths 10294 and 10314, predictions.
(see Figure 102 for profile)

Path Number: _ _ _ 1 0 2 9 4

Code Number: 1 1 2 2 2 3 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Haswell, Colorado*

Data type *795 hourly medians*, Distance *156.0* km, h_{rs} *1334* m-msl

N_s *251* N-units, a *7856* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *230* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *114* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2699	1339
gain [dBi], main beam		
height [m], above site surface		5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		43
elevation [m-msl]		1487
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°22'58.8"N
longitude	104°51'50.4"W	103°08'27.6"W
Path bearing		
elevation [m-msl]		

Other information.

OT/TRER 16, fig. 2.34

Figure 106. Path 10294, parameters.

Path Number: _ _ _ 1 0 3 1 4

Code Number: 1 1 3 1 2 3 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Haswell, Colorado*

Data type *7007 hourly medians*, Distance *156.0* km, h_{rs} *1334* m-msl

N_s *251* N-units, a *7856* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *1046* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *114* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670	1346.6
gain [dBi], main beam		
height [m], above site surface		12.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		43.0
elevation [m-msl]		1487
elevation angle [deg]		
Location, latitude	38°45'50.4"N	38°22'58.8"N
longitude	104°51'50.4"W	103°08'27.6"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.34

Figure 107. Path 10314, parameters.

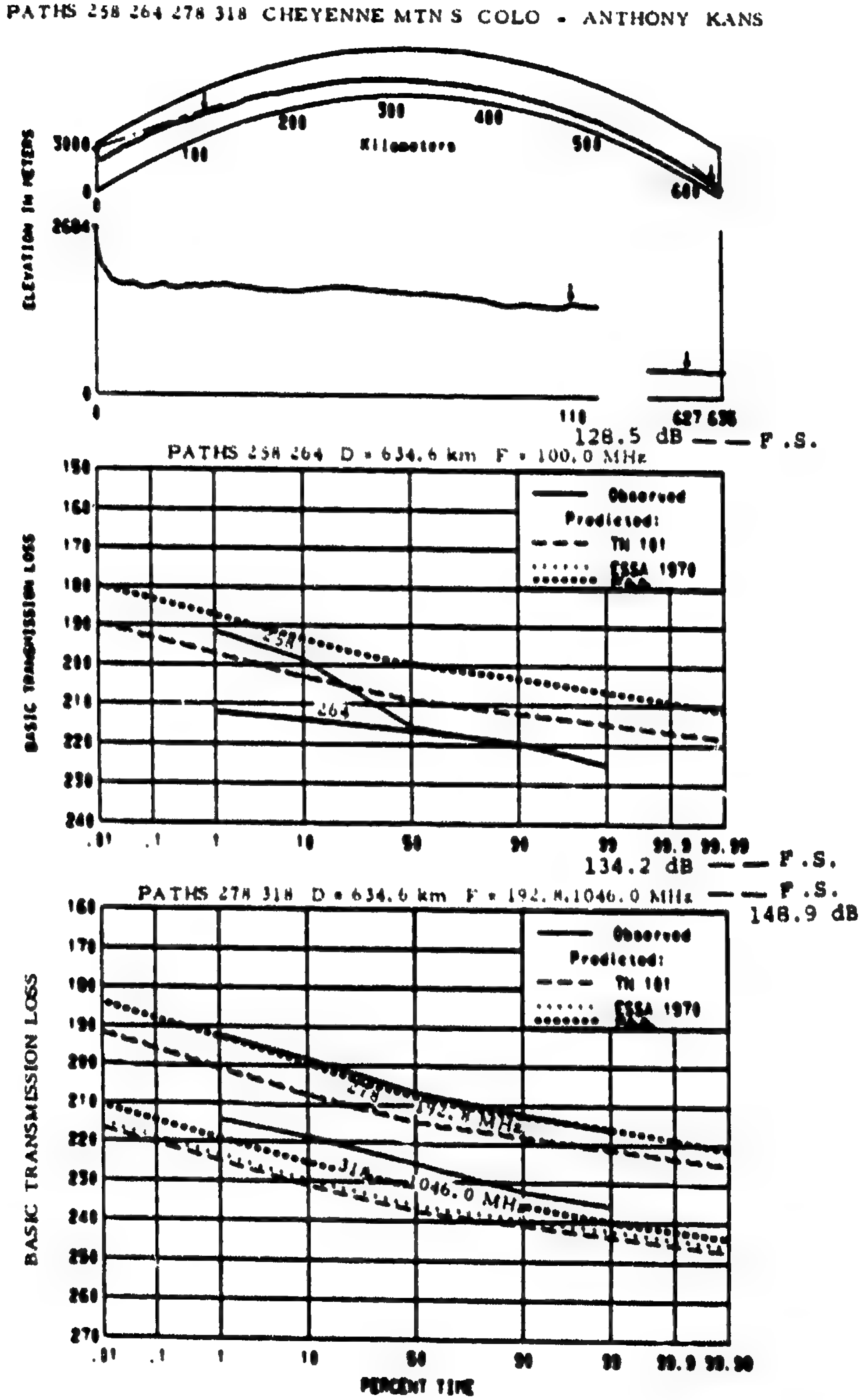


Figure 108. Paths 10258, 10264, 10278, and 10318, profile predictions.

Path Number: _ _ _ 1 0 2 5 8

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Anthony, Kansas*

Data type *537 hourly medians*, Distance *634.6* km, h_{rs} *407* m-msl

N_s *272* N-units, a *8090* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *100* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *171* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2683.8	418.8
gain [dBi], main beam		
height [m], above site surface		11.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		8
elevation [m-msl]		432.8
elevation angle [deg]		
Location, latitude	38°45'50.4"N	37°14'24"N
longitude	104°51'50.4"W	97°53'52.8"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.67

Figure 109. Path 10258, parameters.

Path Number: _ _ _ 1 0 2 6 4

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Anthony, Kansas*

Data type *266 hourly medians*, Distance *634.6* km, h_{rs} *407* m-msl

N_s *272* N-units, a *8090* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *100* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *171* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2683.8	418.8
gain [dBi], main beam		
height [m], above site surface		11.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		8
elevation [m-msl]		432.8
elevation angle [deg]		
Location, latitude	38°45'50.4"N	37°14'24"N
longitude	104°51'50.4"W	97°53'52.8"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.67

Figure 110. Path 10264, parameters.

Path Number: _ _ _ 1 0 2 7 8

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Anthony, Kansas*

Data type *243 hourly medians*, Distance *634.6* km, h_{rs} *407* m-msl

N_s *272* N-units, a *8090* km, Surface type *average ground*.

Climate *continental temperate*, de ______ km

Frequency *192.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *171* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2699	418.8
gain [dBi], main beam		
height [m], above site surface		11.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		8
elevation [m-msl]		432.8
elevation angle [deg]		
Location, latitude	38°45'50.4"N	37°14'24"N
longitude	104°51'50.4"W	97°53'52.8"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.67

Figure 111. Path 10278, parameters.

Path Number: _ _ _ 1 0 3 1 8

Code Number: 1 1 3 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Summit, Colorado - Anthony, Kansas*

Data type *184 hourly medians*, Distance *634.6* km, h_{rs} *407* m-msl

N_s *272* N-units, a *8090* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *1046* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *171* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2670	409.6
gain [dBi], main beam		
height [m], above site surface		2.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		8.0
elevation [m-msl]		432.8
elevation angle [deg]		
Location, latitude	38°45'50.4"N	37°14'24"N
longitude	104°51'50.4"W	97°53'52.8"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.67

Figure 112. Path 10318, parameters.

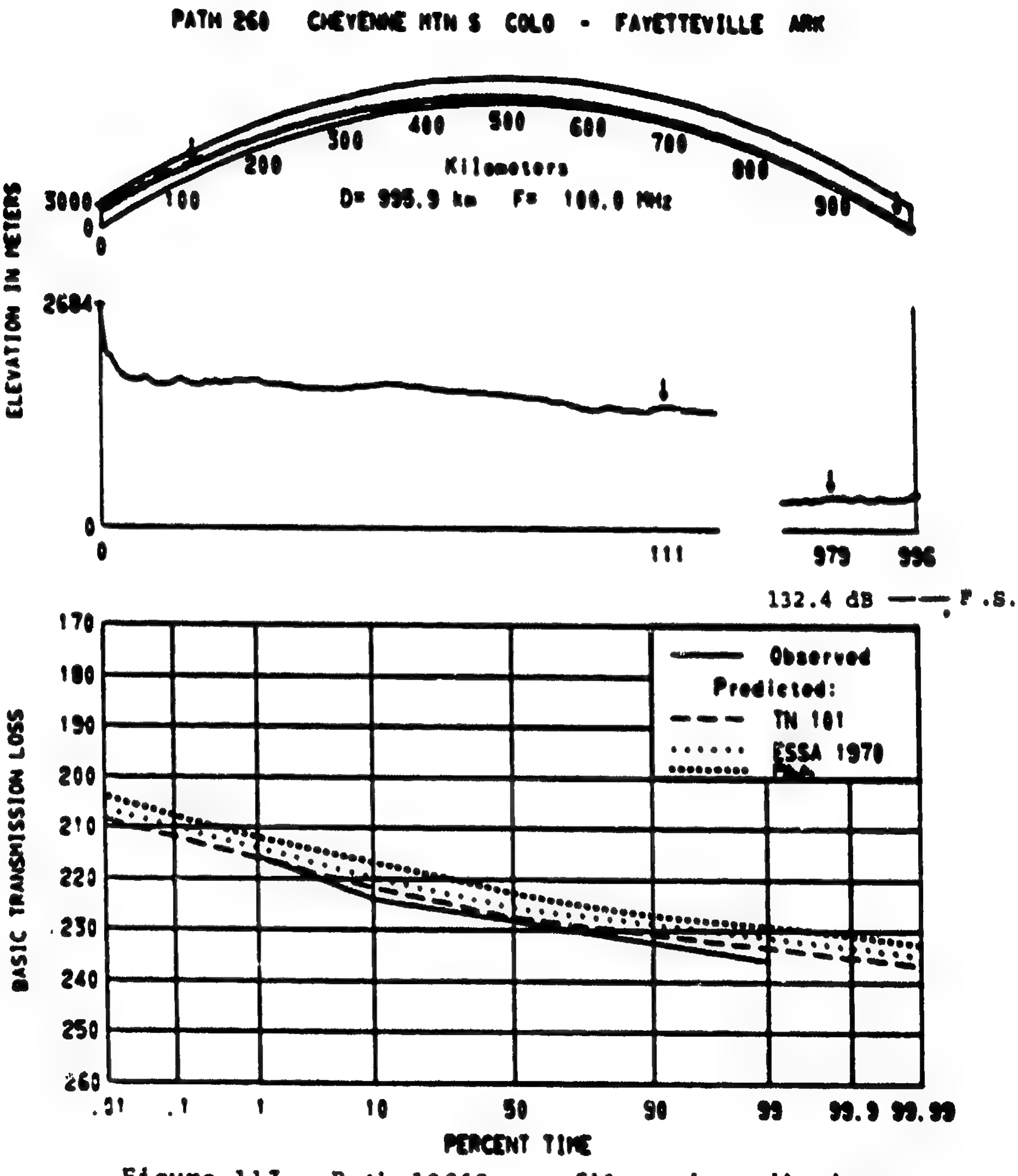


Figure 113. Path 10260, profile and predictions.

Path Number: _ _ _ 1 0 2 6 0

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 2 8 1 1

Location: Cheyenne Mountain Summit, Colorado - Fayetteville, Arkansas

Data type 120 hourly medians, Distance 995.9 km, h_{rs} 396.2 m-msl

N_s 276 N-units, a 8140 km, Surface type average ground

Climate continental temperate, de ______ km

Frequency 100 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 384 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2683.8	432.2
gain [dBi], main beam		
height [m], above site surface		11.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		16.6
elevation [m-msl]		396.2
elevation angle [deg]		
Location, latitude	38°45'50.4"N	36°06'25.2"N
longitude	104°51'50.4"W	94°06'25.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.70

Figure 114. Path 10260, parameters.

PATHS 299 300 PIKES PEAK COLO - GUN BARREL HILL COLO

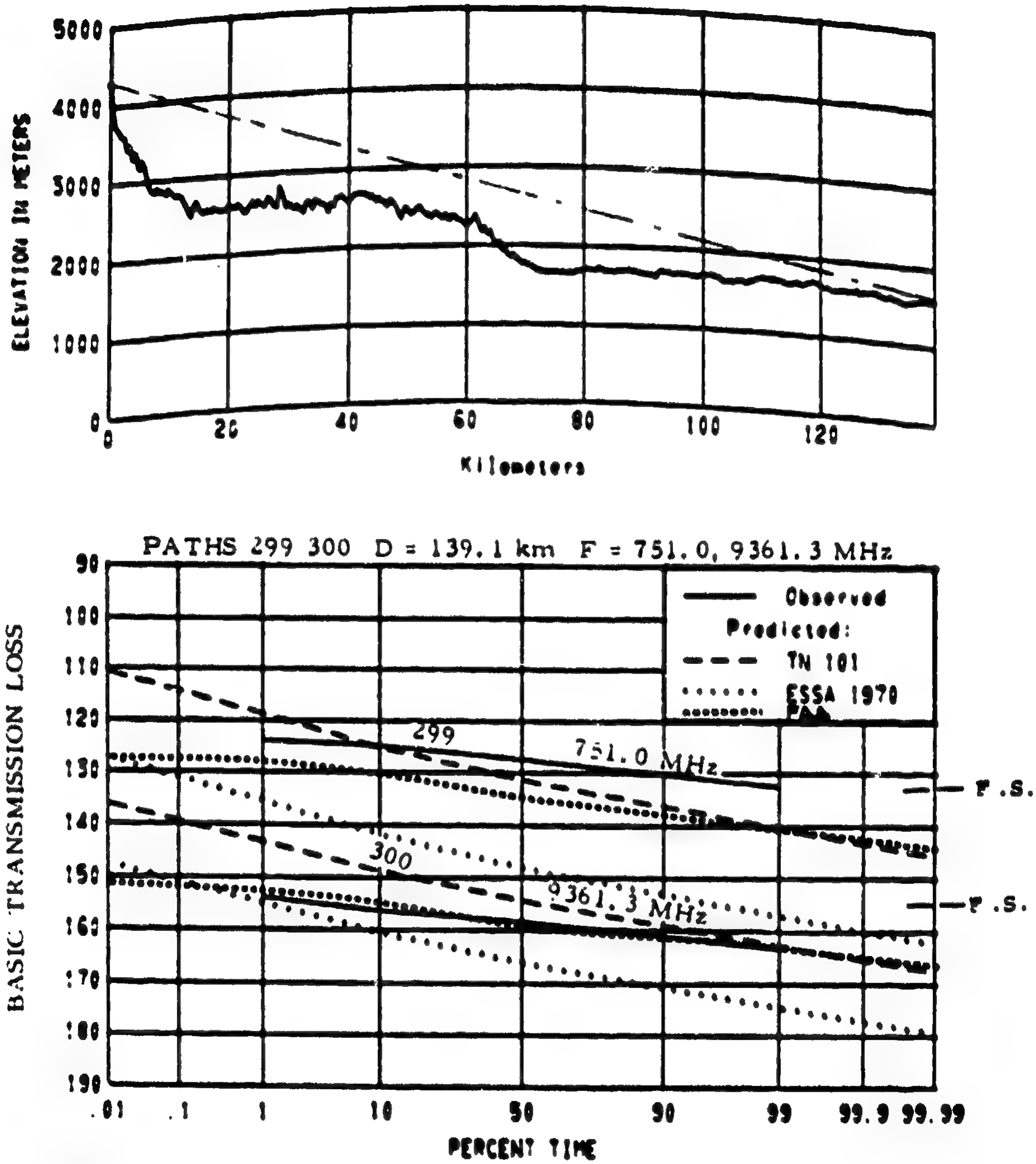


Figure 115. Paths 10299 and 10300, profile and predictions.

Path Number: _ _ _ 1 0 2 9 9

Code Number: 1 1 2 7 1 0 0 4 5 2 1 1 2 7 1 1

Location: *Pikes Peak, Colorado - Gunbarrel Hill, Colorado*

Data type *192 hourly medians*, Distance *139.1* km, h_{rs} *1583* m-msl

N_s *249* N-units, a *7836* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *751* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *518* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	4302.5	1585.7
gain [dBi], main beam		
height [m], above site surface		2.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		10.06
elevation [m-msl]		1633
elevation angle [deg]		
Location, latitude	38°50'26.2"N	40°05'31"N
longitude	105°02'38.5"W	105°07'17.5"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.14

Figure 116. Path 10299, parameters.

Path Number: _ _ _ 1 0 3 0 0

Code Number: 1 1 3 9 1 0 0 4 5 2 1 1 2 7 1 1

Location: *Pikes Peak, Colorado - Gunbarrel Hill, Colorado*

Data type *315 hourly medians*, Distance *139.1* km, h_{rs} *1583* m-msl

N_s *249* N-units, a *7836* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *9361.3* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *518* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	4302.5	1585.7
gain [dBi], main beam		
height [m], above site surface		2.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		10.06
elevation [m-msl]		1633
elevation angle [deg]		
Location, latitude	38°50'26.2"N	40°05'31"N
longitude	105°02'38.5"W	105°07'17.5"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.14

Figure 117. Path 10300, parameters.

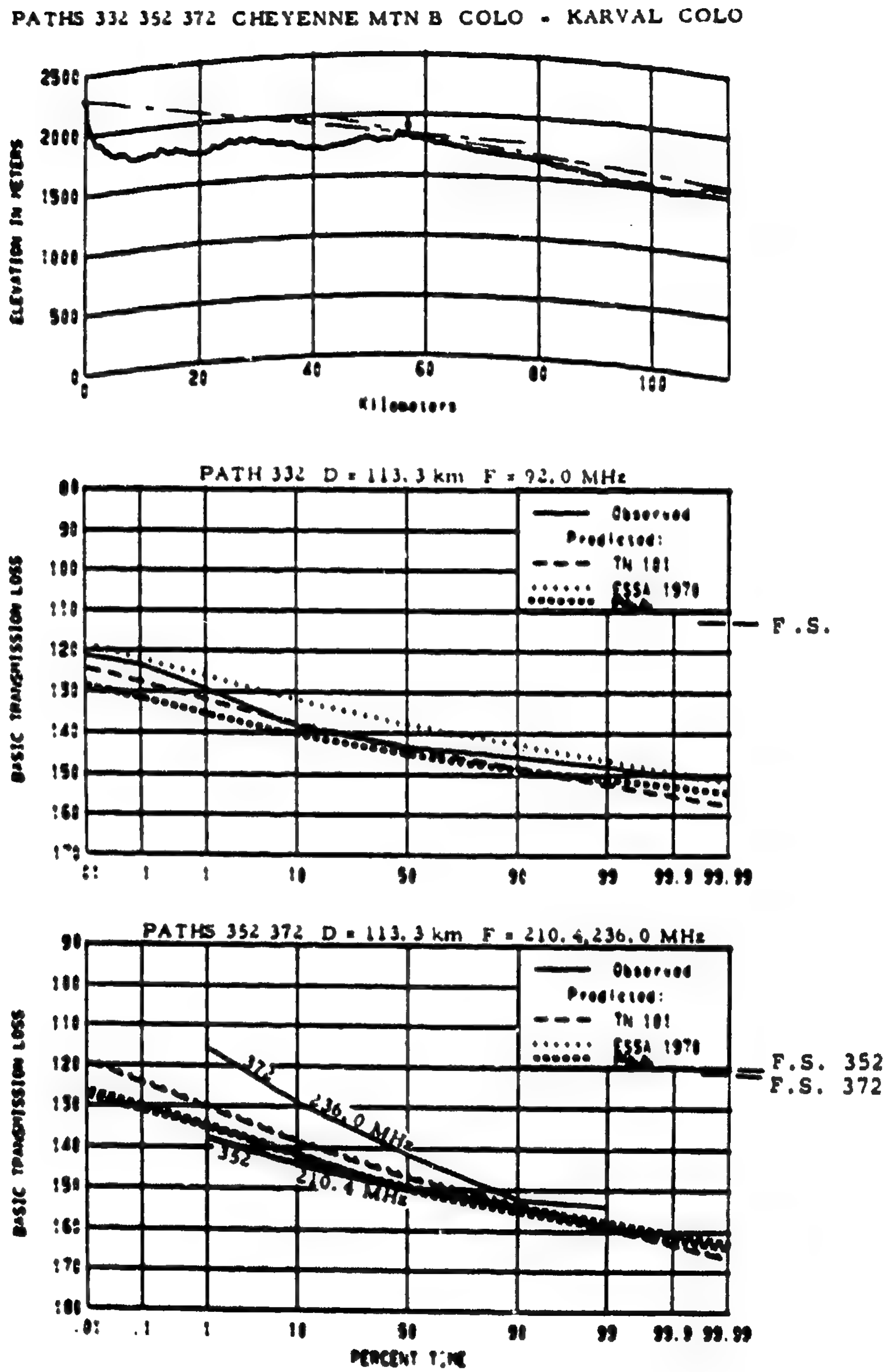


Figure 118. Paths 10332, 10352, and 10372, profile and predictions.

Path Number: _ _ _ 1 0 3 3 2

Code Number: 1 1 2 0 2 3 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Base, Colorado - Karval, Colorado*

Data type *6594 hourly medians*, Distance *113.3* km, h_{rs} *1561* m-msl

N_s *241* N-units, a *7758* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *92* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *163* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2281.4	1571.9
gain [dBi], main beam		
height [m], above site surface		10.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		56.5
elevation [m-msl]		1829
elevation angle [deg]		
Location, latitude	38°46'26.4"N	38°37'55.2"N
longitude	104°51'43.2"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.32

Figure 119. Path 10332, parameters.

Path Number: 1 0 3 5 2

Code Number: 1 1 2 2 2 3 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Base, Colorado - Karval, Colorado*

Data type *1244 hourly medians*, Distance *113.3* km, h_{rs} *1561* m-msl

N_s *241* N-units, a *7758* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *210.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *163* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2287.5	1571.6
gain [dBi], main beam		
height [m], above site surface		10.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		56.5
elevation [m-msl]		1829
elevation angle [deg]		
Location, latitude	38°46'26.4"N	38°37'55.2"N
longitude	104°51'43.2"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.32

Figure 120. Path 10352, parameters.

Path Number: _ _ _ 1 0 3 7 2

Code Number: 1 1 2 2 2 3 0 4 5 2 1 1 2 8 1 1

Location: Cheyenne Mountain Base, Colorado - Karval, Colorado

Data type 483 hourly medians, Distance 113.3 km, h_{rs} 1561 m-msl

N_s 241 N-units, a 7758 km, Surface type average ground

Climate continental temperate, de ______ km

Frequency 236 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 163 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2287.5	1571.6
gain [dBi], main beam		
height [m], above site surface		10.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		56.5
elevation [m-msl]		1829
elevation angle [deg]		
Location, latitude	38°46'26.4"N	38°37'55.2"N
longitude	104°51'43.2"W	103°34'19.2"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.32

Figure 121. Path 10372, parameters.

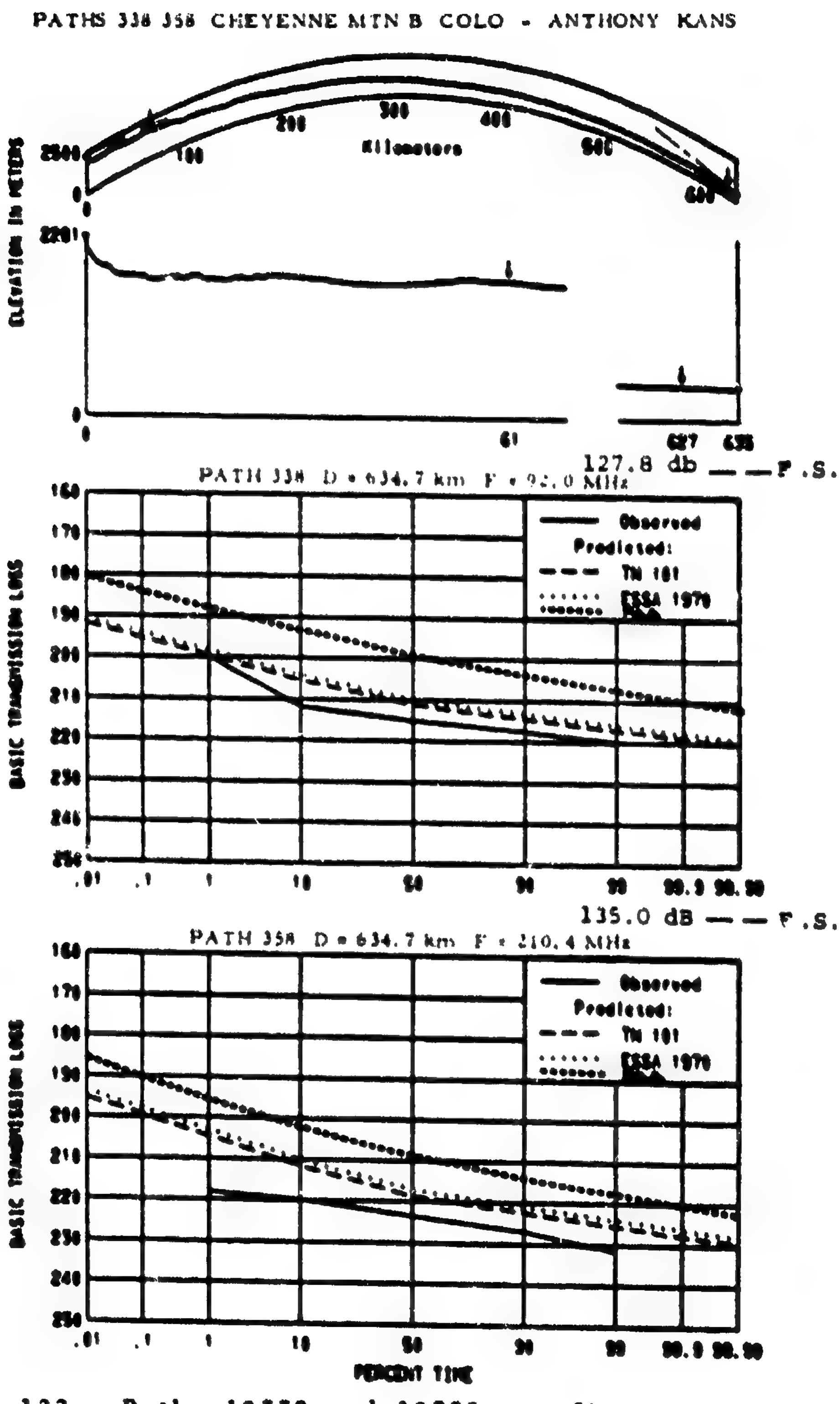


Figure 122. Paths 10338 and 10358, profile and predictions.

Path Number: _ _ _ 1 0 3 3 8

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Base, Colorado - Anthony, Kansas*

Data type *134 hourly medians*, Distance *634.7* km, h_{rs} *407* m-msl

N_s *268* N-units, a *8042* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *92* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *171* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	2281.4	418.8
gain [dBi], main beam		
height [m], above site surface		11.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		8.1
elevation [m-msl]		432.8
elevation angle [deg]		
Location, latitude	38°46'26.4"N	37°14'24"N
longitude	104°51'43.2"W	97°53'52.8"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.68

Figure 123. Path 10338, parameters.

Path Number: _ _ _ 1 0 3 5 8

Code Number: 1 1 2 2 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cheyenne Mountain Base, Colorado - Anthony, Kansas*

Data type *148 hourly medians*, Distance *634.7* km, h_{rs} *407* m-msl

N_s *268* N-units, a *8042* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *210.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *171* m, θ ______ mr.

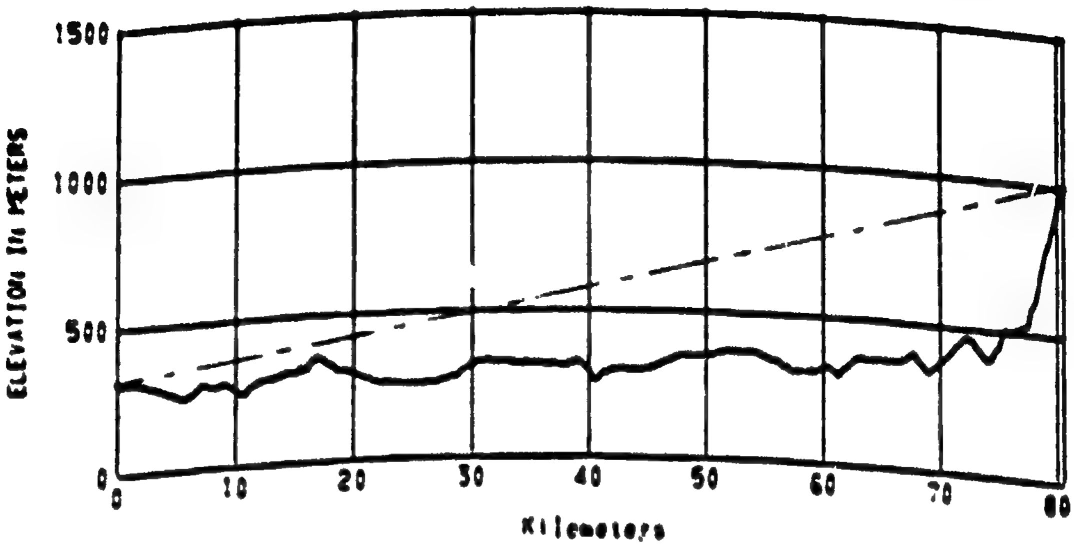
	Transmitter	Receiver
Antenna elevation [m-msl]	2287.5	418.8
gain [dBi], main beam		
height [m], above site surface		11.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		8.1
elevation [m-msl]		432.8
elevation angle [deg]		
Location, latitude	38°46'26.4"N	37°14'24"N
longitude	104°51'43.2"W	97°53'52.8"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.68

Figure 124. Path 10358, parameters.

PATHS 447 TO 449 GEORGIA TECH GA - MT OGLETHORPE GA



PATH 449 D = 80.5 km F = 1310.0 MHz

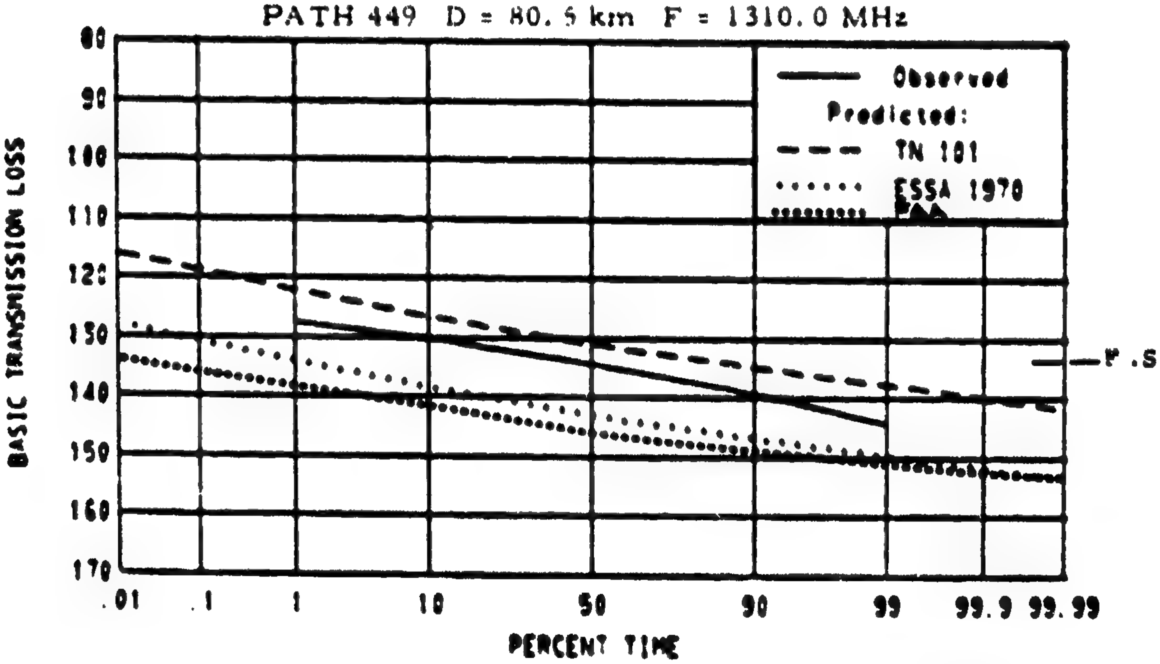


Figure 125. Path 10449, profile and predictions.

Path Number: 1 0 4 4 9

Code Number: 1 1 3 1 1 0 0 4 5 2 1 1 2 2 1 1

Location: *Georgia Technology, Georgia - Mt. Oglethorpe, Georgia*

Data type *1500 hourly medians*, Distance *80.5* km, h_{rs} *298* m-msl

N_s *296* N-units, a *8416* km, Surface type *average ground*

Climate *continental temperate* , de km

Frequency *1310* MHz, Transmitter output dBW, EIRP dBW

Δh *125* m, θ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	317	1005.9
gain [dBi], main beam		
height [m], above site surface	18.3	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		80.5
elevation [m-msl]		1001.9
elevation angle [deg]		
Location, latitude		
longitude		
Path bearing		
elevation [m-msl]		

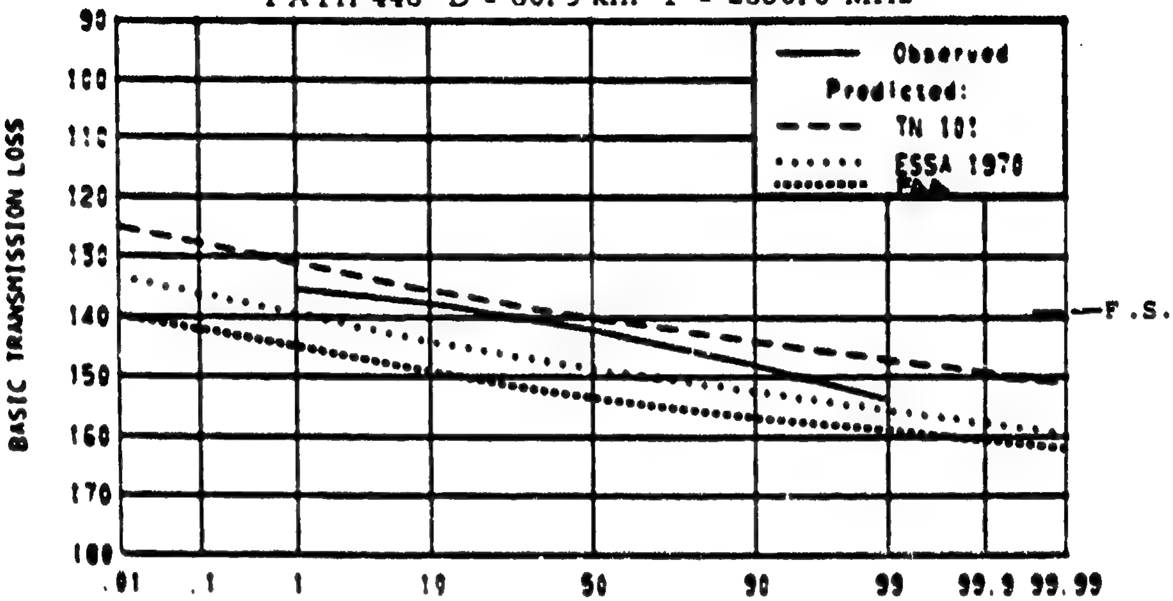
Other information:

OT/TRER 16, fig. 1.9

Figure 126. Path 10449, parameters.

GEORGIA TECH GA - MT OGLETHORPE GA

PATH 448 D = 80.5 km F = 2860.0 MHz



PATH 447 D = 80.5 km F = 9404.0 MHz

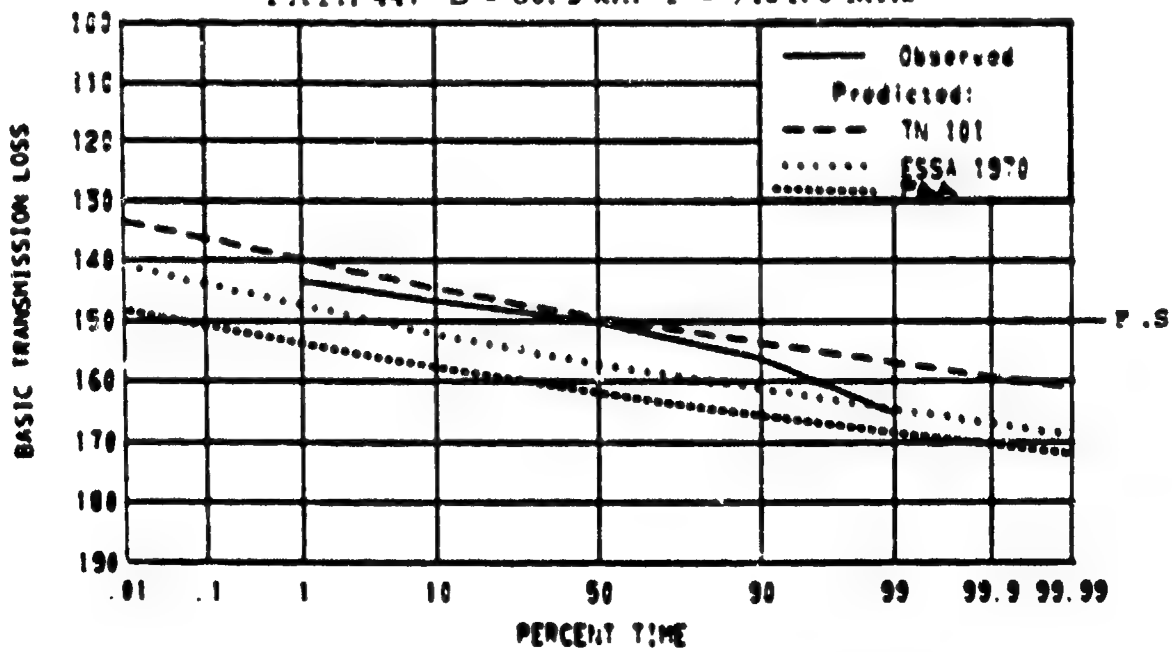


Figure 127. Paths 10448 and 10447, predictions.
(see Figure 125 for profile)

Path Number: _ _ _ 1 0 4 4 8

Code Number: 1 1 3 2 1 0 0 4 5 2 1 1 2 2 1 1

Location: *Georgia Technology, Georgia - Mt. Oglethorpe, Georgia*

Data type *1 year of hourly medians*, Distance *80.5* km, h_{rs} *298* m-msl

N_s *296* N-units, a *8416* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *2860* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *125* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	317	1005.9
gain [dBi], main beam		
height [m], above site surface	18.3	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		80.5
elevation [m-msl]		1001.9
elevation angle [deg]		
Location, latitude		
longitude		
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.10

Figure 128. Path 10448, parameters.

Path Number: _ _ _ 1 0 4 4 7

Code Number: 1 1 3 9 1 0 0 4 5 2 1 1 2 2 1 1

Location: *Georgia Technology, Georgia - Mt. Oglethorpe, Georgia*

Data type *2000 hourly medians*, Distance *80.5* km, h_{rs} *298* m-msl

N_s *296* N-units, a *8416* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *9404* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *125* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	317	1005.9
gain [dBi], main beam		
height [m], above site surface	18.3	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		80.5
elevation [m-msl]		1001.9
elevation angle [deg]		
Location, latitude		
longitude		
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.10

Figure 129. Path 10447, parameters.

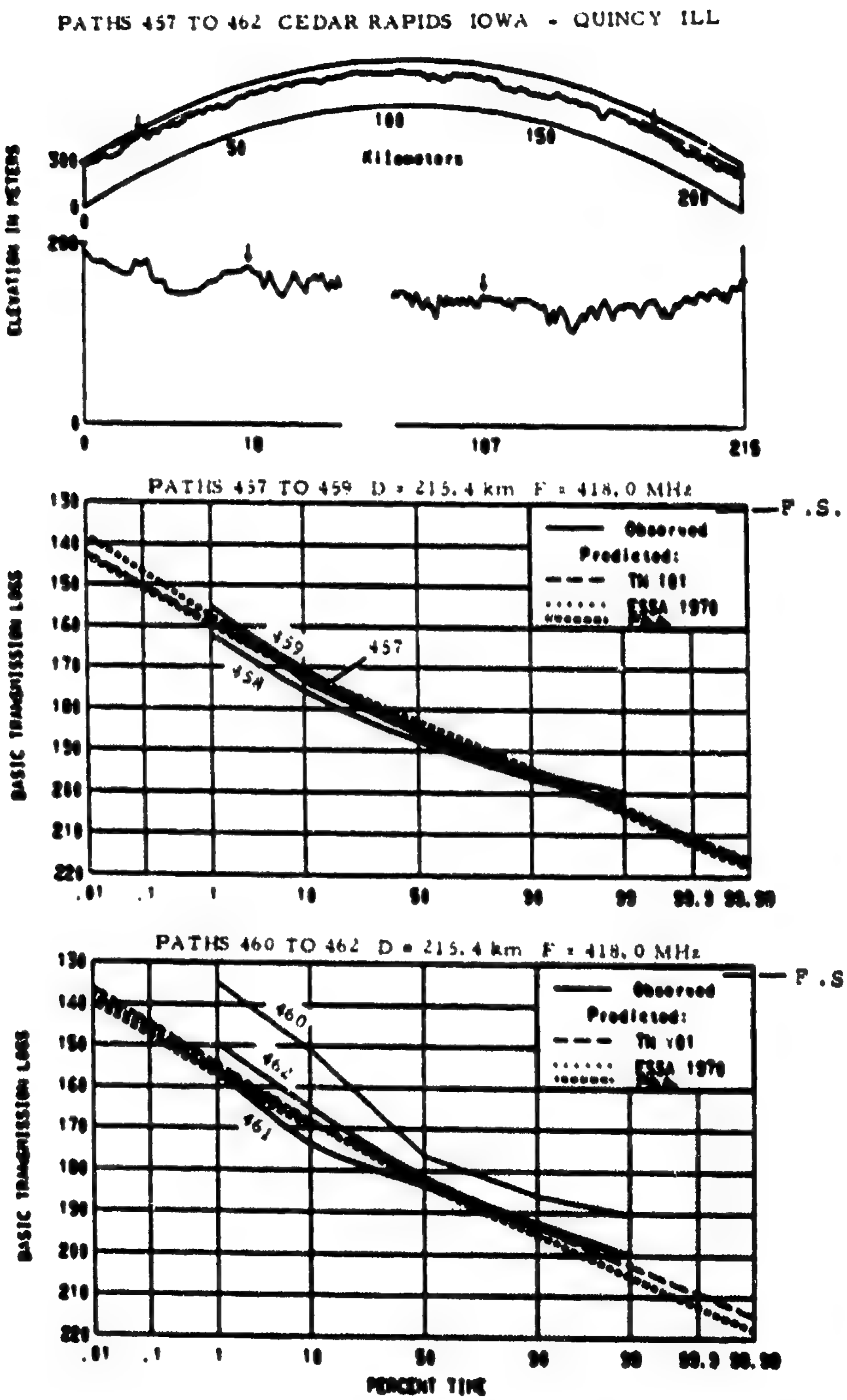


Figure 130. Paths 10457 through 10462, profile and predictions.

Path Number: 1 0 4 5 7

Code Number: 1 1 2 4 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cedar Rapids, Iowa - Quincy, Illinois*

Data type *3100 hourly medians*, Distance *215.4* km, h_{rs} *207.9* m-msl

N_s *303* N-units, a *8525* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *418* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *41* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	287.7	234.7
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		28.0
elevation [m-msl]		207.9
elevation angle [deg]		
Location, latitude	41°53'26"N	39°58'22"N
longitude	91°42'40"W	91°19'54"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.22

Figure 131. Path 10457, parameters.

Path Number: _ _ _ 1 0 4 5 8

Code Number: 1 1 2 4 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cedar Rapids, Iowa - Quincy, Illinois*

Data type *1164 hourly medians*, Distance *215.4* km, h_{rs} *221.6* m-msl

N_s *303* N-units, a *8525* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *418* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *41* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	287.7	275.9
gain [dBi], main beam		
height [m], above site surface		50.3
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		42
elevation [m-msl]		221.6
elevation angle [deg]		
Location, latitude	41°53'26"N	39°58'22"N
longitude	91°42'40"W	91°19'54"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.22

Figure 132. Path 10458, parameters.

Path Number: _ _ _ 1 0 4 5 9

Code Number: 1 1 2 4 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cedar Rapids, Iowa - Quincy, Illinois*

Data type *1864 hourly medians*, Distance 215.4 km, h_{rs} 221.6 m-msl

N_s 303 N-units, a 8525 km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency 418 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 41 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	287.7	336.9
gain [dBi], main beam		
height [m], above site surface	11.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	17.7	
elevation [m-msl]	252.4	
elevation angle [deg]		
Location, latitude	41°53'26"N	39°58'22"N
longitude	91°42'40"W	91°19'54"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.22

Figure 133. Path 10459, parameters.

Path Number: _ _ _ 1 0 4 6 0

Code Number: 1 1 2 4 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cedar Rapids, Iowa - Quincy, Illinois*

Data type *191 hourly medians*, Distance *215.4* km, h_{rs} *221.6* m-msl

N_s *303* N-units, a *8525* km, Surface type *average ground*

Climate *continental temperate*, de _____ km

Frequency *418* MHz, Transmitter output _____ dBW, EIRP _____ dBW

h *41* m, σ _____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	287.7	367.3
gain [dBi], main beam		
height [m], above site surface	11.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	17.7	
elevation [m-msl]	252.4	
elevation angle [deg]		
Location, latitude	41°53'26"N	39°58'22"N
longitude	91°42'40"W	91°19'54"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.22

Figure 134. Path 10460, parameters.

Path Number: _ _ _ 1 0 4 6 1

Code Number: 1 1 2 4 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cedar Rapids, Iowa - Quincy, Illinois*

Data type *1057 hourly medians*, Distance 215.4 km, h_{rs} 252.4 m-msl

N_s 303 N-units, a 8525 km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency 418 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 41 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	287.7	397.8
gain [dBi], main beam		
height [m], above site surface	11.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	17.7	
elevation [m-msl]	252.4	
elevation angle [deg]		
Location, latitude	41°53'26"N	39°58'22"N
longitude	91°42'40"W	91°19'54"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.22

Figure 135. Path 10461, parameters.

Path Number: 1 0 4 6 2

Code Number: 1 1 2 4 3 0 0 4 5 2 1 1 2 8 1 1

Location: *Cedar Rapids, Iowa - Quincy, Illinois*

Data type *2322 hourly medians*, Distance *215.4* km, h_{rs} *252.4* m-msl

N_s *303* N-units, a *8525* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *418* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *41* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	282.7	428.3
gain [dBi], main beam		
height [m], above site surface	11.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	17.7	
elevation [m-msl]	252.4	
elevation angle [deg]		
Location, latitude	41°53'26"N	39°58'22"N
longitude	91°42'40"W	91°19'54"W
Path bearing		
elevation [m-msl]		

Other information

OT/TRER 16, fig. 3.22

Figure 136. Path 10462, parameters.

PATHS 903 904 ROUND HILL MASS - CRAWFORDS HILL N J

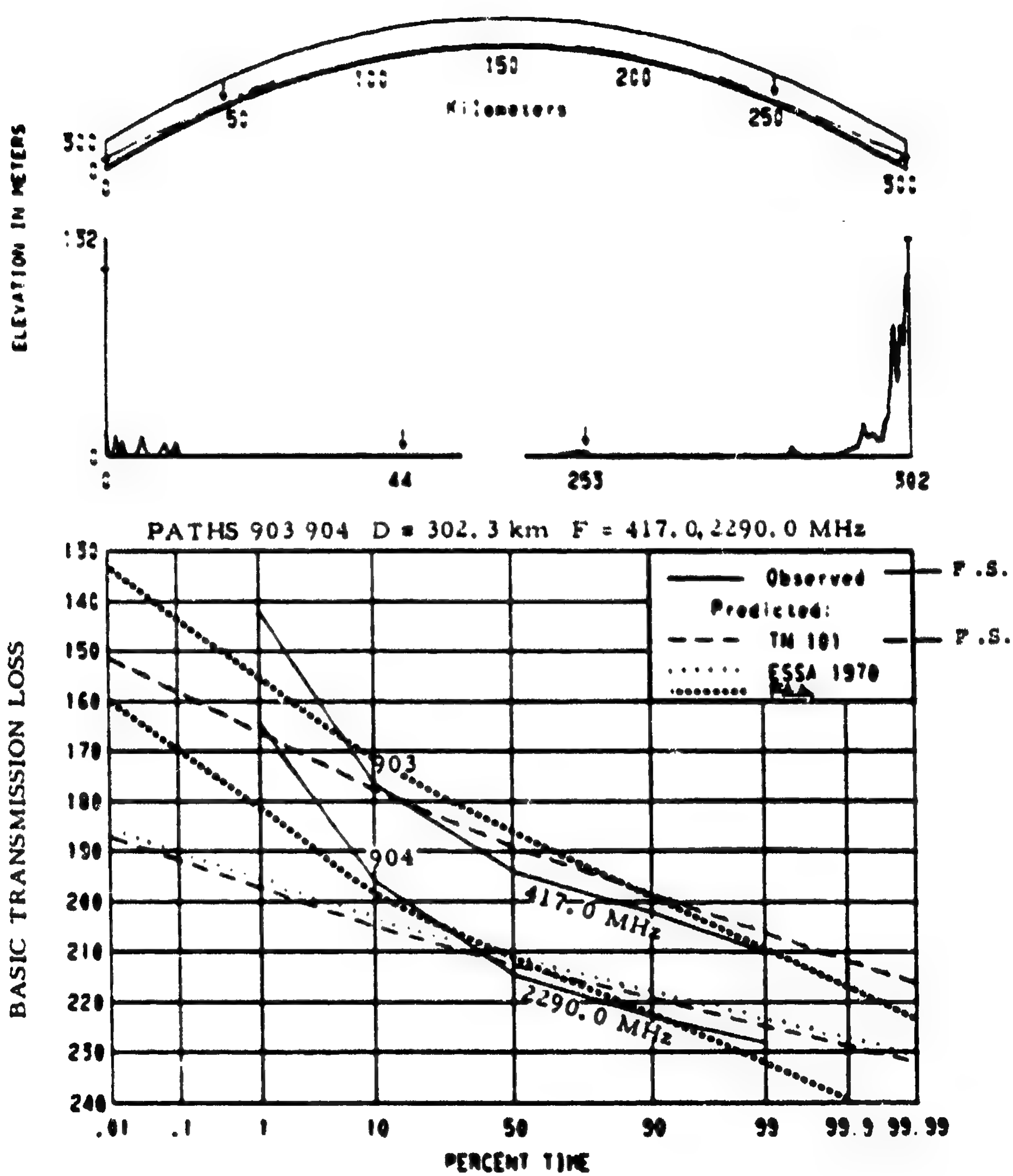


Figure 137. Paths 10903 and 10904, profile and predictions.

Path Number: _ _ _ 1 0 9 0 3

Code Number: 1 1 2 4 3 0 0 4 5 3 1 1 2 1 1 1

Location: *Round Hill, Massachusetts - Crawford's Hill, New Jersey*

Data type *240 hourly medians*, Distance *302.3* km, h_{rs} *0* m-msl

N_s *312* N-units, a *8676* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *417* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	113.4	132.3
gain [dBi], main beam		
height [m], above site surface	98.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	41°32'24"N	40°23'31"N
longitude	70°55'51"W	74°11'13"W
Path bearing		
elevation [m-msl]		

Other information.

OT/TRER 16, fig. 3.48

Figure 138. Path 10903, parameters.

Path Number: _ _ _ 1 0 9 0 4

Code Number: 1 1 3 2 3 0 0 4 5 3 1 1 2 1 1 1

Location: Round Hill, Massachusetts - Crawford's Hill, New Jersey

Data type 240 hourly medians, Distance 302.3 km, h_{rs} 0 m-msl

N_s 312 N-units, a 86.76 km, Surface type sea water

Climate maritime temperate oversea, de ______ km

Frequency 2290 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 0 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	113.4	132.3
gain [dBi], main beam		
height [m], above site surface	98.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	41°32'24"N	40°23'31"N
longitude	70°55'51"W	74°11'13"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.48

Figure 139. Path 10904, parameters.

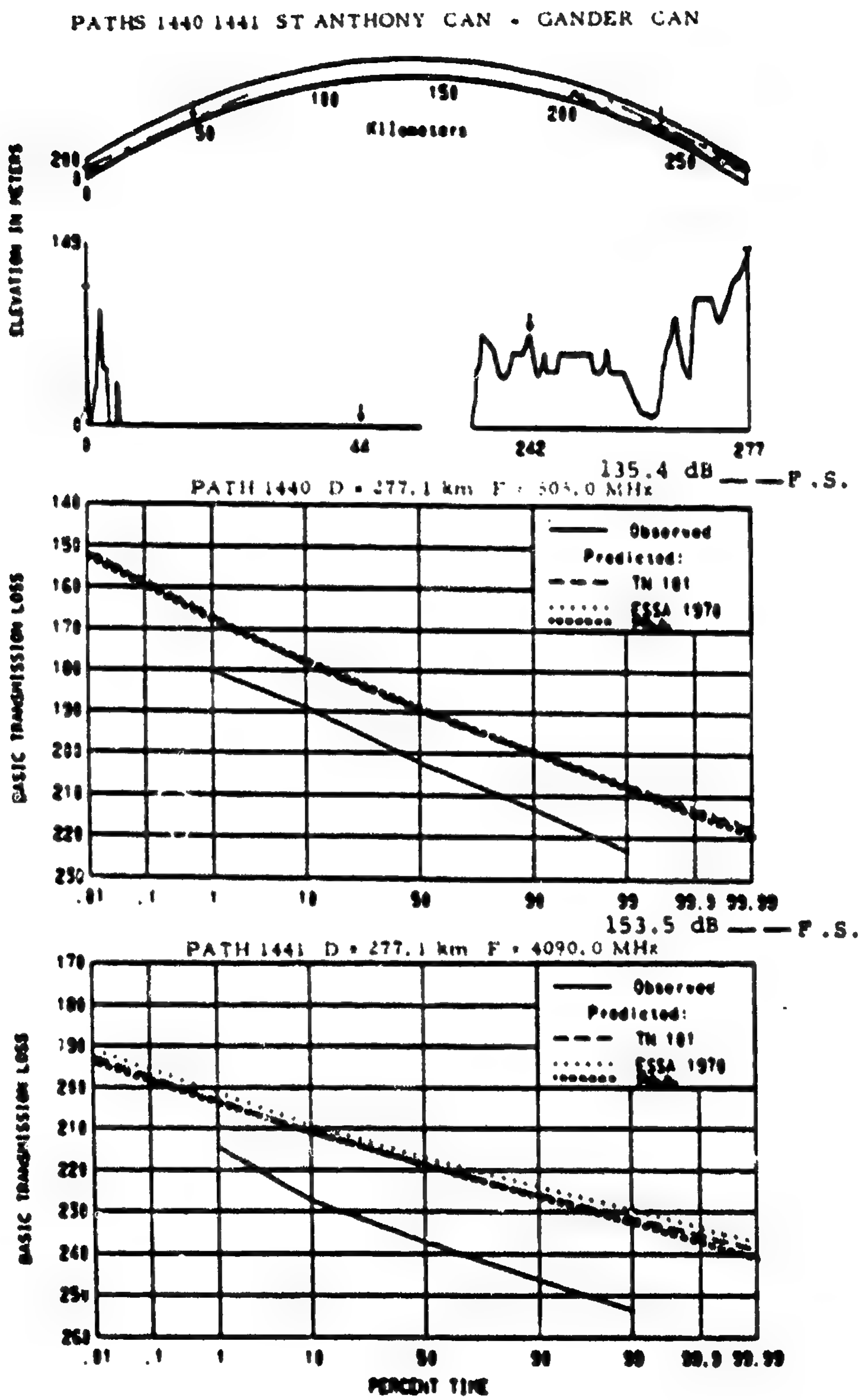


Figure 140. Paths 11440 and 11441, profile and predictions.

Path Number: _ _ _ 1 1 4 4 0

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 6 1 1 1

Location: *St. Anthony, Newfoundland - Gander, Newfoundland*

Data type *6241 hourly medians*, Distance *277.1* km, h_{rs} *0* m-msl

N_s *312* N-units, a *8676* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *505* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *50.2* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	113.4	148.5
gain [dBi], main beam		
height [m], above site surface		5.2
line loss [dB]		
polarization	V	V
type		
Horizon distance [km]		35.52
elevation [m-msl]		75.9
elevation angle [deg]		
Location, latitude	51°20'55"N	48°57'01"N
longitude	55°37'15"W	54°34'50"W
Path bearing		
elevation [m-msl]		
Other information.		

OT/TRER 16, fig. 3.194

Figure 141. Path 11440, parameters.

Path Number: _ _ _ 1 1 4 4 1

Code Number: 1 1 3 4 3 0 0 4 5 2 1 1 6 1 1 1

Location: *St. Anthony, Newfoundland - Gander, Newfoundland*

Data type *5954 hourly medians*, Distance *277.1* km, h_{rs} *0* m-msl

N_s *312* N-units, a *8676* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *4090* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *50.2* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	113.4	148.5
gain [dBi], main beam		
height [m], above site surface		5.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		35.52
elevation [m-msl]		75.9
elevation angle [deg]		
Location, latitude	51°20'55"N	48°57'01"N
longitude	55°37'15"W	54°34'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.194

Figure 142. Path 11441, parameters.

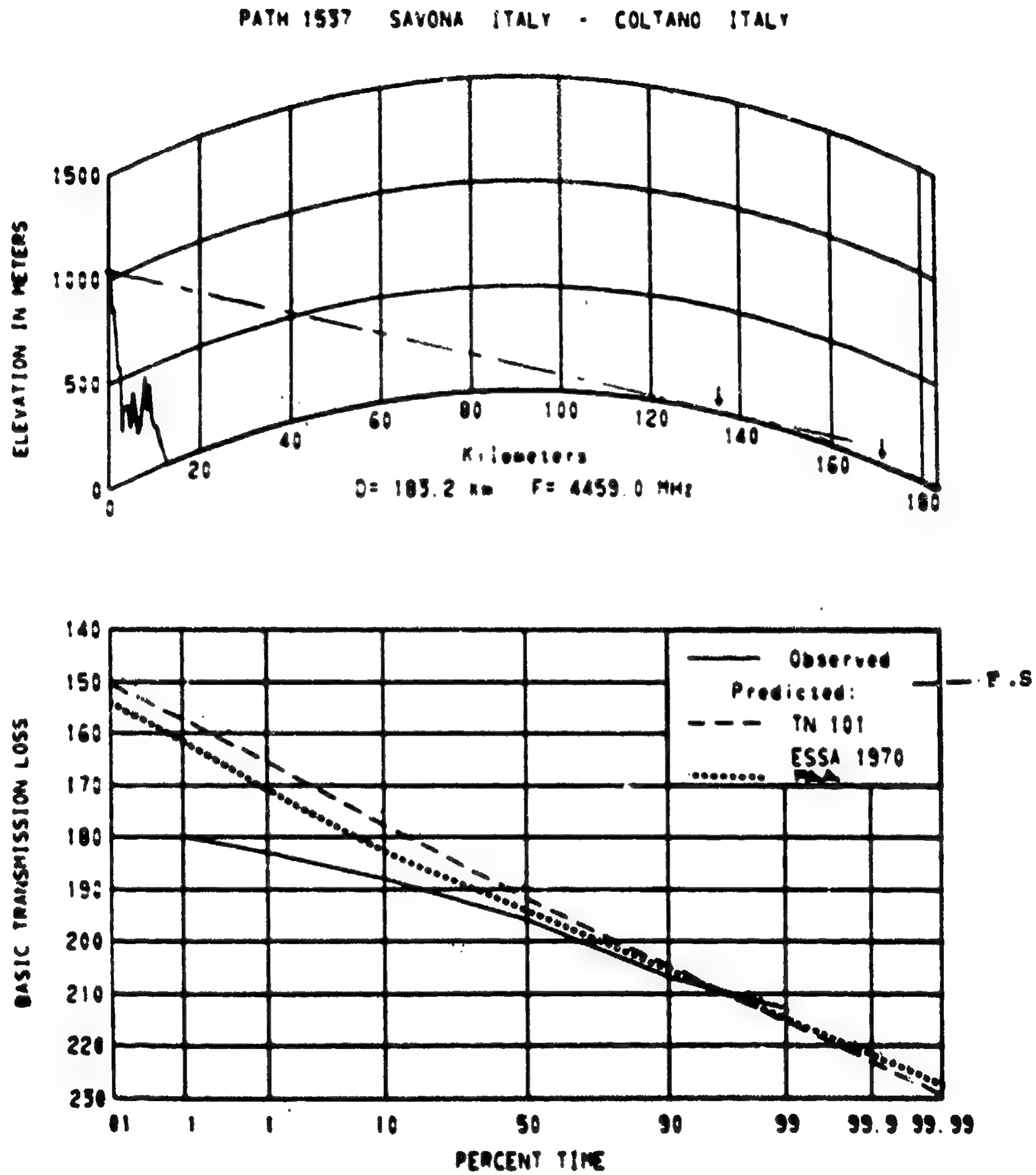


Figure 143. Path 11537, profile and predictions.

Path Number: _ _ _ 1 1 5 3 7

Code Number: 1 1 3 4 3 0 0 4 5 3 1 1 3 3 1 1

Location: *Savana, Italy - Coltano, Italy*

Data type *269 hourly medians*, Distance *183.2* km, h_{rs} *0* m-msl

N_s *320* N-units, a *8822* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *4459* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1036	8.0
gain [dBi], main beam		
height [m], above site surface		7.0
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	44°14'57.6"N	43°39'33"N
longitude	8°16'47.9"E	10°24'52"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.201

Figure 144. Path 11537, parameters.

PATH 1594 PARNIS GREECE - CHIOS ISLAND GREECE

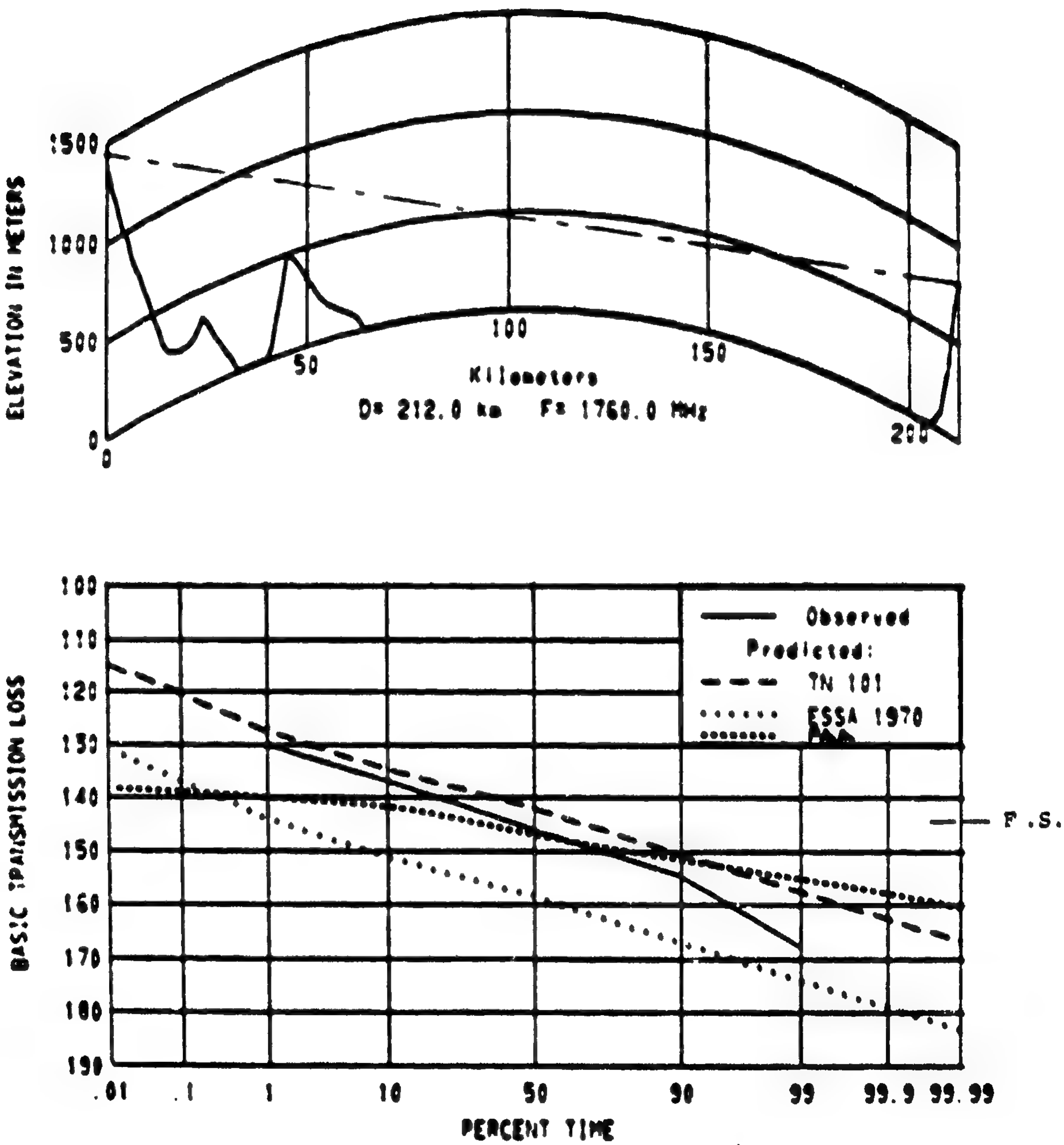


Figure 145. Path 11594, profile and predictions.

Path Number: _ _ _ 1 1 5 9 4

Code Number: 1 1 3 1 1 0 0 4 5 3 1 1 3 3 1 1

Location: *Parnis, Greece - Chios Island, Aegean Sea*

Data type *100 days of hourly medians*, Distance *212.0* km, h_{rs} *0* m-msl

N_s *294* N-units, a *8386* km, Surface type *seawater*

Climate *maritime temperate oversea*, de ______ km

Frequency *1760* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1450	800
gain [dBi], main beam		
height [m], above site surface		4
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude		
longitude		
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.38

Figure 146. Path 11594, parameters.

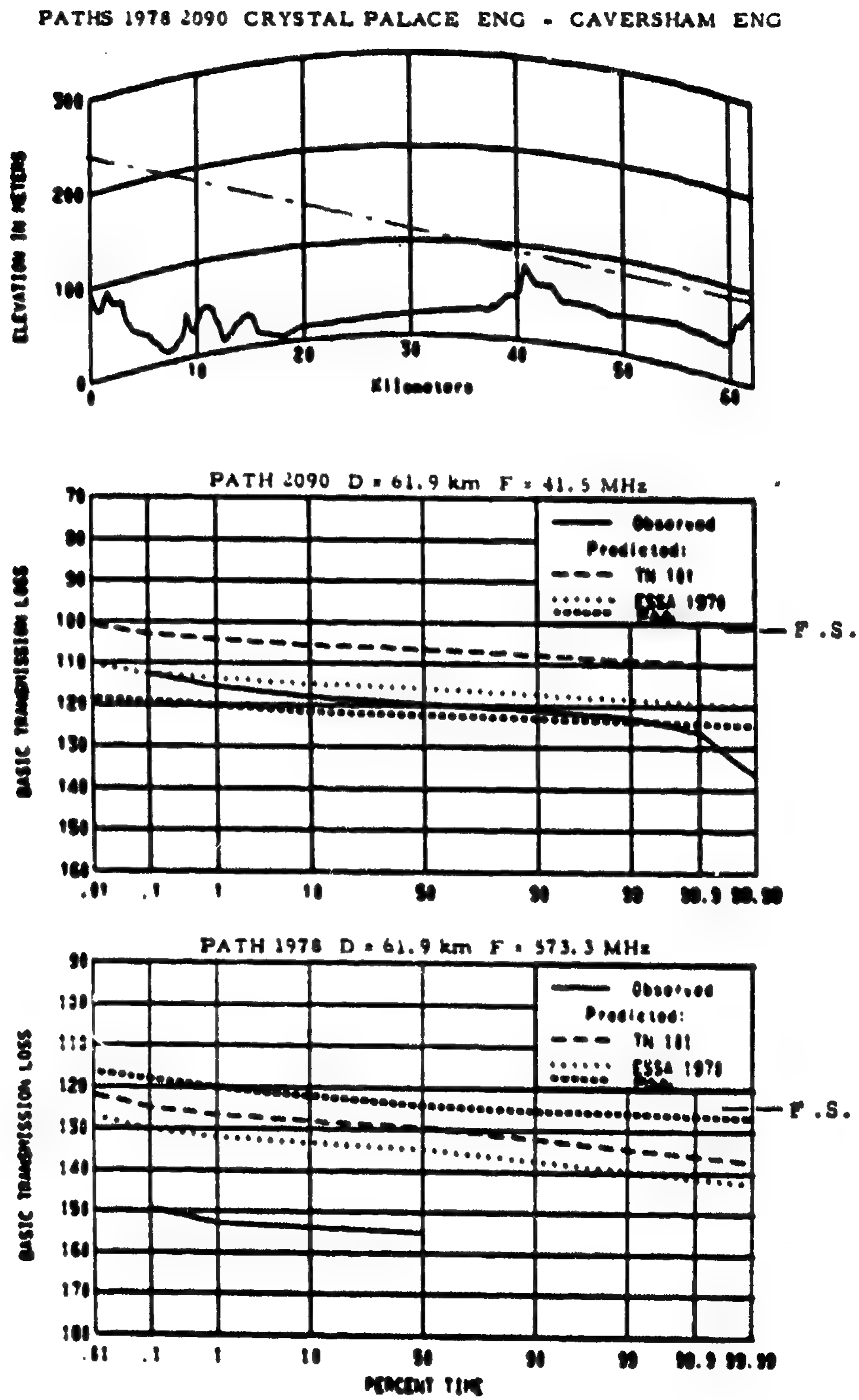


Figure 147. Paths 12090 and 11978, profile and predictions.

Path Number: _ _ _ 1 2 0 9 0

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 3 1 1 1

Location: *Crystal Palace, England - Caversham, England*

Data type *2588 hourly medians*, Distance *61.9* km, h_{rs} *40* m-msl

N_s *315* N-units, a *8729* km, Surface type *average ground*

Climate *maritime temperate overland*, de ____ km

Frequency *41.5* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *53* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	240.2	91.4
gain [dBi], main beam		
height [m], above site surface		13.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		21.
elevation [m-msl]		76.
elevation angle [deg]		
Location, latitude	51°25'20"N	51°28'52"N
longitude	0°04'17"W	0°57'23"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.18

Figure 148. Path 12090, parameters.

Path Number: _ _ _ 1 1 9 7 8

Code Number: 1 1 2 5 1 0 0 4 5 2 1 1 3 1 1 1

Location: *Crystal Palace, England - Caversham, England*

Data type *27 months of hourly medians*, Distance *61.9* km, h_{rs} *40* m-msl

N_s *315* N-units, a *8729* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *573.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *53* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	290	88.7
gain [dBi], main beam		
height [m], above site surface		11
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		21.
elevation [m-msl]		76.
elevation angle [deg]		
Location, latitude	51°25'20"N	51°28'52"N
longitude	0°04'17"W	0°57'23"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.18

Figure 149. Path 11978, parameters.

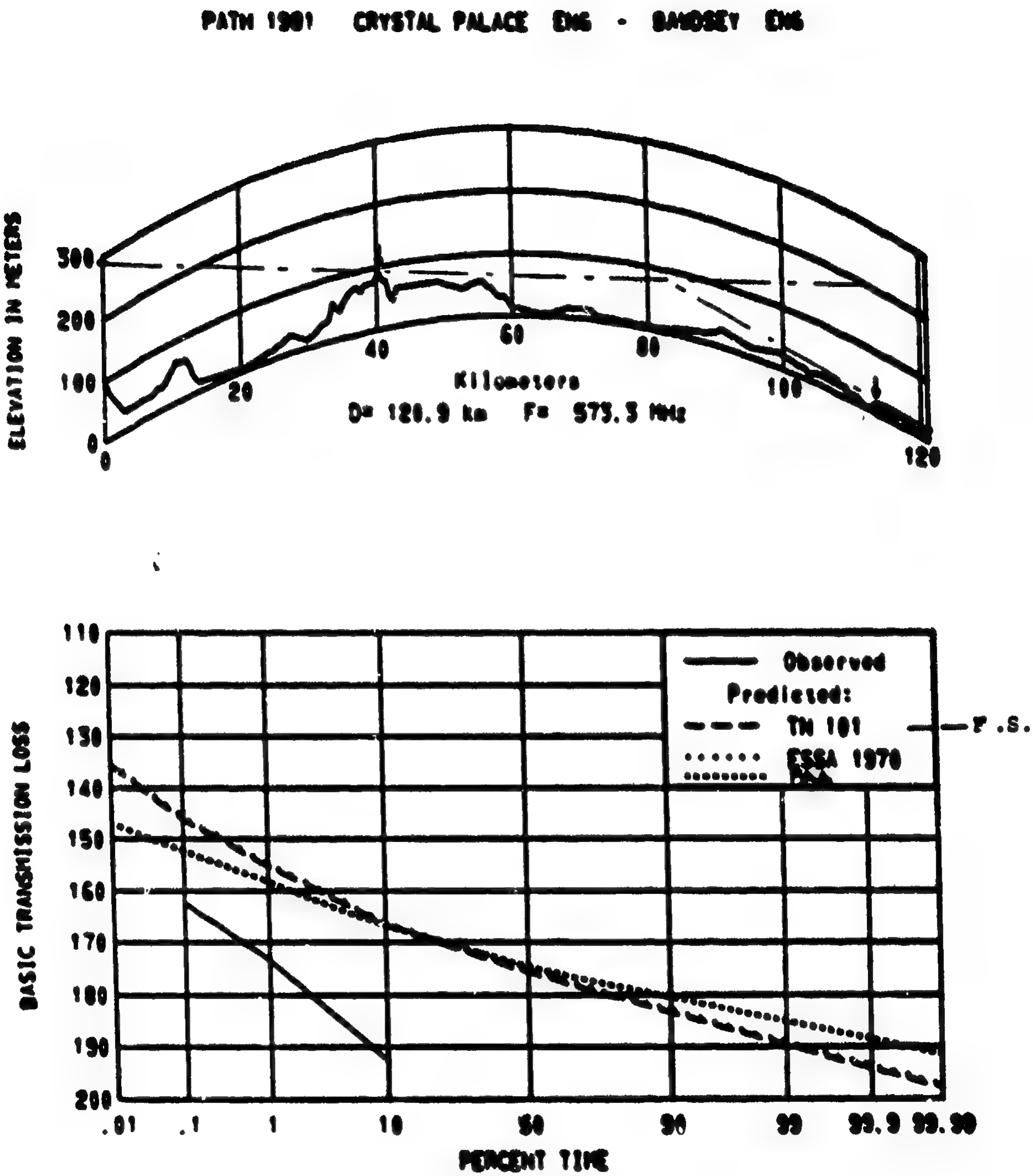


Figure 150. Path 11981, profile and predictions.

Path Number: _ _ _ 1 1 9 8 1

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Crystal Palace, England - Bawdsey, England*

Data type *27 months of hourly medians*, Distance *120.9* km, h_{rs} *5* m-msl

N_s *319* N-units, a *8803* km, Surface type *average ground*

Climate *maritime temperate overland*, de ____ km

Frequency *573.2* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *55.4* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	290	18
gain [dBi], main beam		
height [m], above site surface		13
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		7.4
elevation [m-msl]		15.
elevation angle [deg]		
Location, latitude	51°25'20"N	51°59'45"N
longitude	0°04'17"W	1°25'00"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.72

Figure 151. Path 11981, parameters.

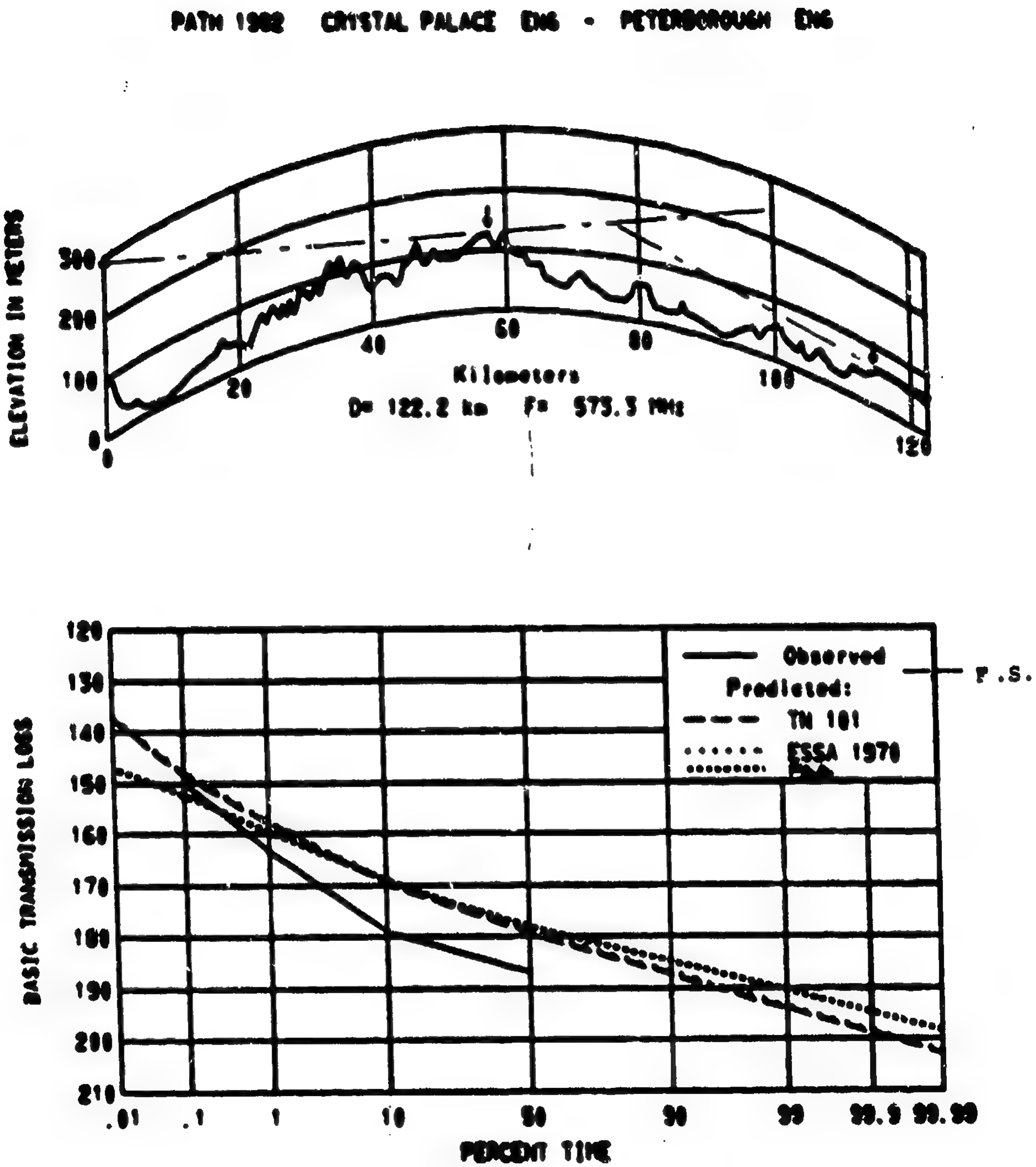


Figure 152. Path 11982, profile and predictions.

Path Number: _ _ _ 1 1 9 8 2

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Crystal Palace, England - Peterborough, England*

Data type *27 months of hourly medians*, Distance 122.2 km, h_{rs} 55 m-msl

N_s 317 N-units, a 8766 km, Surface type *average ground*

Climate *maritime temperate overland*, de ____ km

Frequency 573.2 MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh 87.6 m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	290	64
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		7.64
elevation [m-msl]		61
elevation angle [deg]		
Location, latitude	51°25'20"N	52°30'26"N
longitude	0°04'17"W	0°20'30"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.73

Figure 153. Path 11982, parameters.

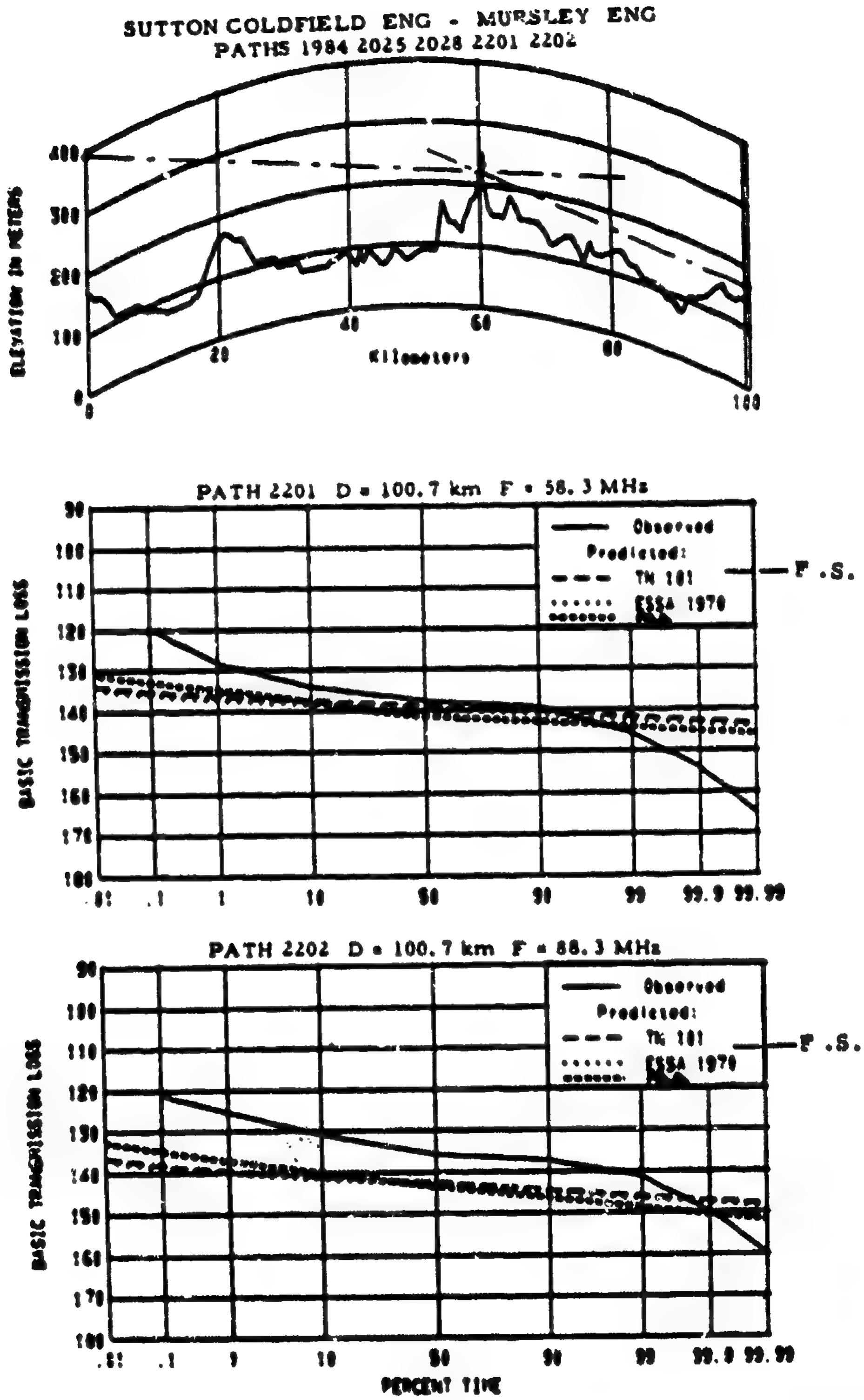


Figure 154. Paths 12201 and 12202, profile and predictions.

Path Number: _ _ _ 1 2 2 0 1

Code Number: 1 1 2 0 2 1 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Hursley, England*

Data type *1418 hourly medians*, Distance *100.7* km, h_{rs} *120* m-msl

N_s *313* N-units, a *8694* km, Surface type *average ground*

Climate *maritime temperate overland*, de ____ km

Frequency *58.2* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *92.1* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	393.2	167
gain [dBi], main beam		
height [m], above site surface		8.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		40.36
elevation [m-msl]		216.4
elevation angle [deg]		
Location, latitude	52°35'59"N	51°57'12"N
longitude	1°49'57"W	0°48'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.5

Figure 155. Path 12201, parameters.

Path Number: _ _ _ 1 2 2 0 2

Code Number: 1 1 2 0 2 1 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Mursley, England*

Data type *1441 hourly medians*, Distance *100.7* km, h_{rs} *120* m-msl

N_s *313* N-units, a *8694* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *88.3* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *92.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	365.8	167
gain [dBi], main beam		
height [m], above site surface		8.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		40.36
elevation [m-msl]		216.4
elevation angle [deg]		
Location, latitude	52°35'59"N	51°57'12"N
longitude	1°49'57"W	0°48'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.5

Figure 156. Path 12202, parameters.

SUTTON COLDFIELD ENG - MURSLEY ENG

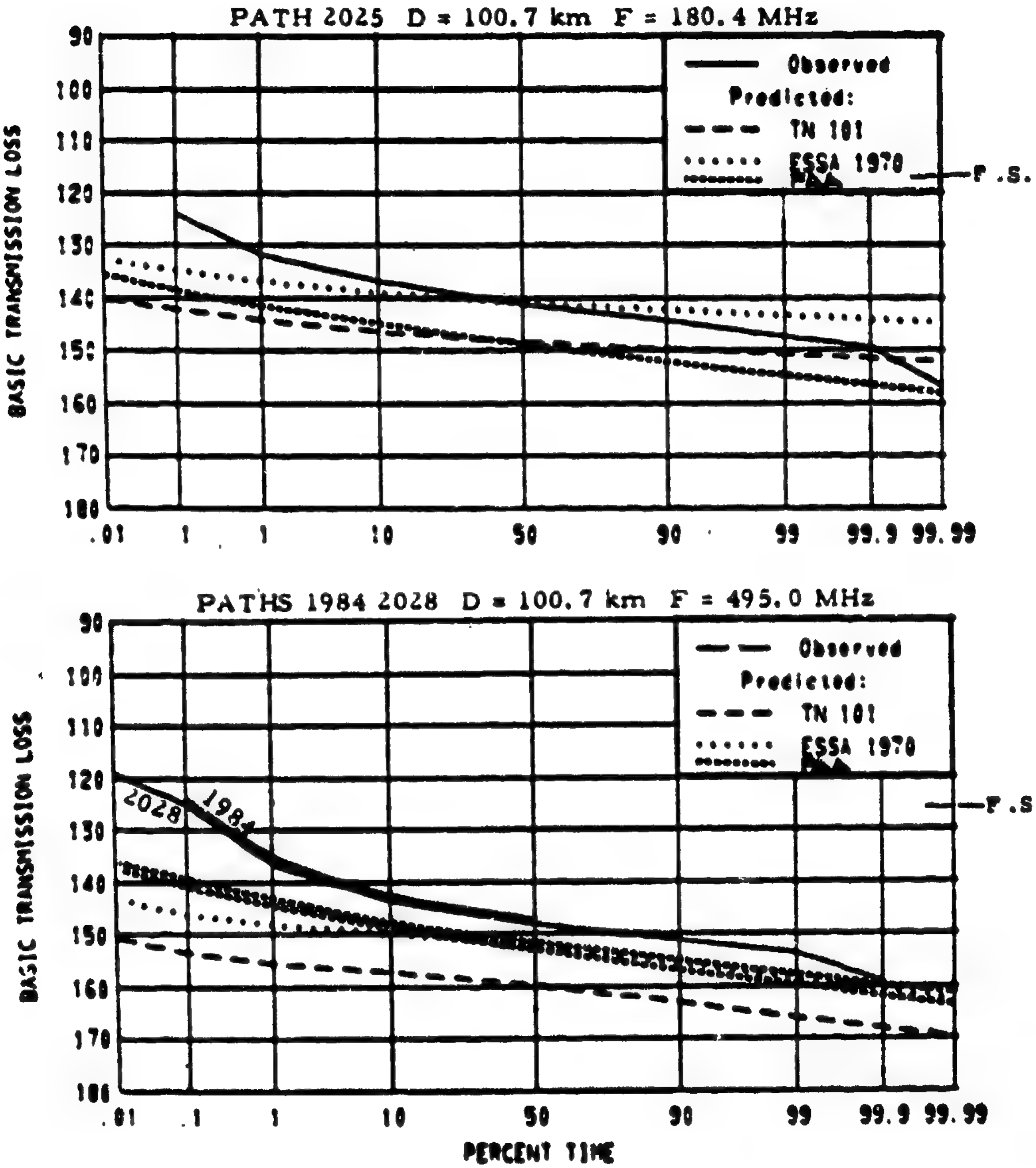


Figure 157. Paths 12025, 11984, and 12028, predictions.
(see Figure 154 for profile)

Path Number: _ _ _ 1 2 0 2 5

Code Number: 1 1 2 1 2 1 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Mursley, England*

Data type *5243 hourly medians*, Distance *100.7* km, h_{rs} *120* m-msl

N_s *313* N-units, a *8694* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *180.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *92.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	348.1	167.1
gain [dBi], main beam		
height [m], above site surface		8.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		40.36
elevation [m-msl]		216.4
elevation angle [deg]		
Location, latitude	52°35'59"N	51°57'12"N
longitude	1°49'57"W	0°48'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.6

Figure 158. Path 12025, parameters.

Path Number: _ _ _ 1 1 9 8 4

Code Number: 1 1 2 4 2 1 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Mursley, England*

Data type *3143 hourly medians*, Distance *100.7* km, h_{rs} *120* m-msl

N_s *313* N-units, a *8694* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *495* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *92.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	394.7	167.6
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		40.36
elevation [m-msl]		216.4
elevation angle [deg]		
Location, latitude	52°35'59"N	51°57'12"N
longitude	1°49'57"W	0°48'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.6

Figure 159. Path 11984, parameters.

Path Number: _ _ _ 1 2 0 2 8

Code Number: 1 1 2 4 2 1 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Mursley, England*

Data type *3143 hourly medians*, Distance *100.7* km, h_{rs} *120* m-msl

N_s *313* N-units, a *8694* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *495* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *92.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	349.9	167
gain [dBi], main beam		
height [m], above site surface		8.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		40.36
elevation [m-msl]		216.4
elevation angle [deg]		
Location, latitude	52°35'59"N	51°57'12"N
longitude	1°49'57"W	0°48'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.6

Figure 160. Path 12028, parameters.

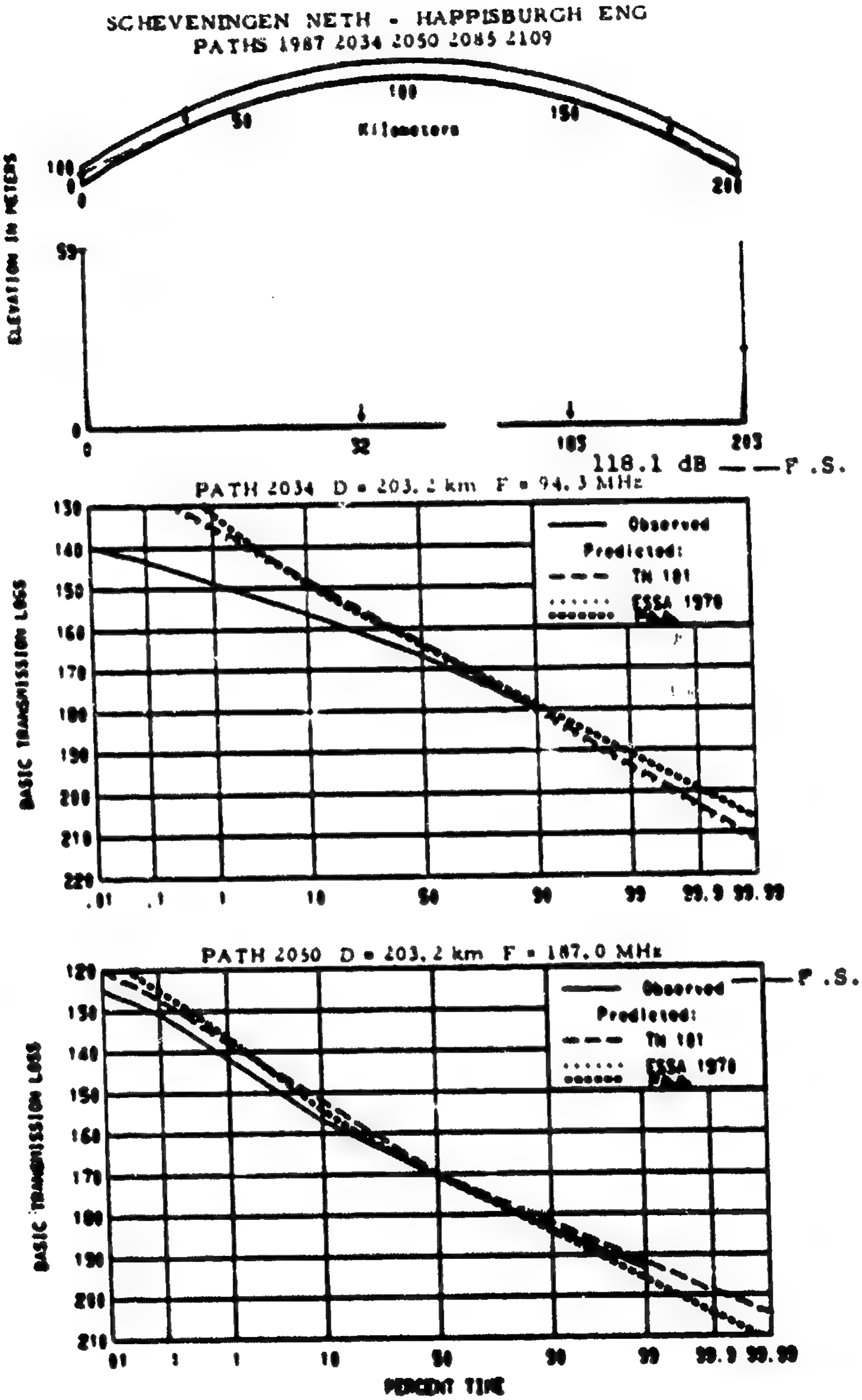


Figure 161. Paths 12034 and 12050, profile and predictions.

Path Number: _ _ _ 1 2 0 3 4

Code Number: 1 1 2 0 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Happisburgh, England*

Data type *5541 hourly medians*, Distance *203.2* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *sea water*

Climate *martime temperate oversea*, de ____ km

Frequency *94.4* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	24.4
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	52°49'42"N
longitude	4°16'E	1°31'38"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.144

Figure 162. Path 12034, parameters.

Path Number: _ _ _ 1 2 0 5 0

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Happisburgh, England*

Data type *6380 hourly medians*, Distance *203.2* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *187* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

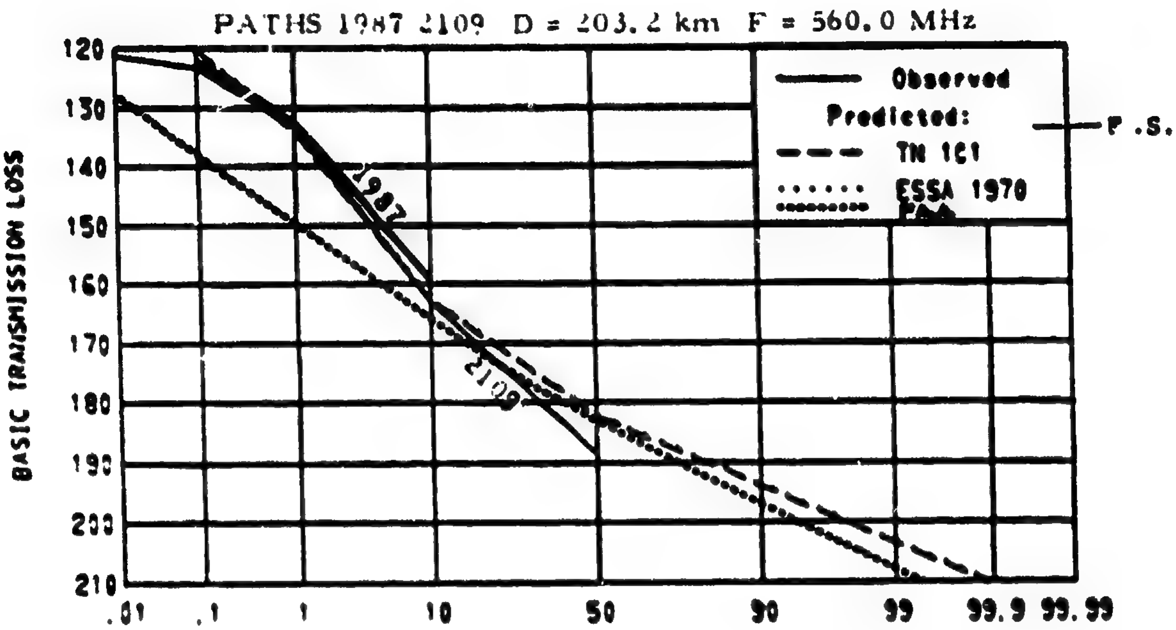
	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	24.4
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	52°49'42"N
longitude	4°16'E	1°31'38"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.144

Figure 163. Path 12050, parameters.

SCHEVENINGEN NETH - HAPPISBURGH ENG



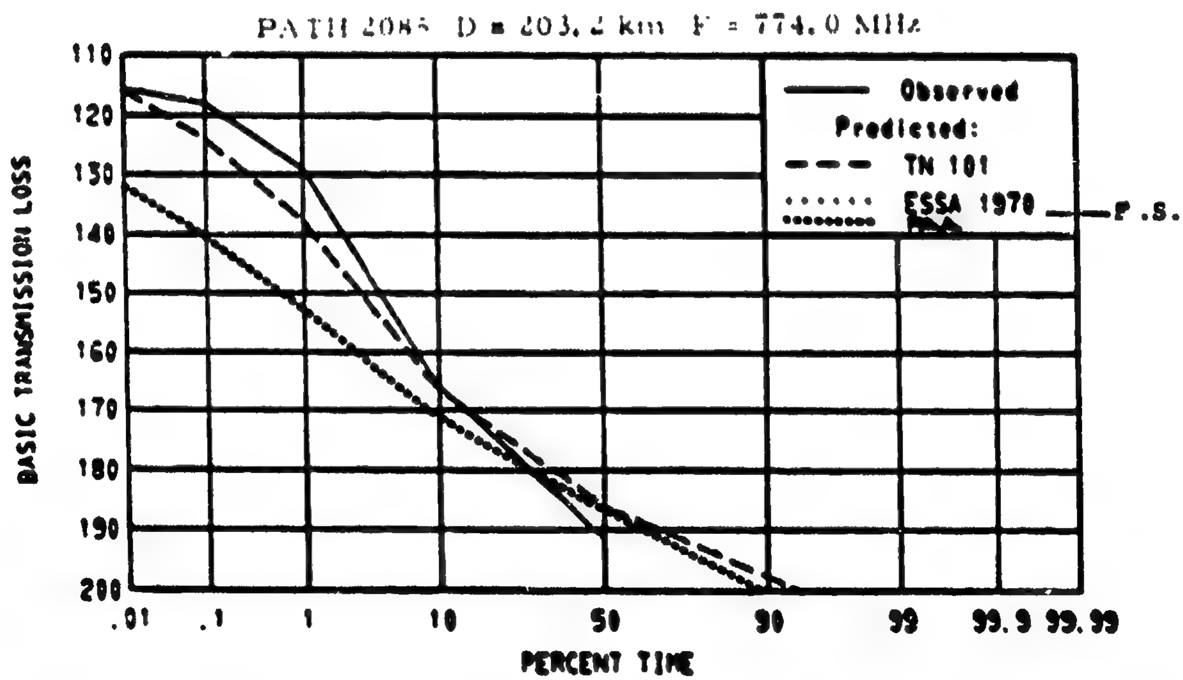


Figure 164. Paths 11987, 12109, and 12085, predictions. (see Figure 161 for profile)

Path Number: _ _ _ 1 1 9 8 7

Code Number: 1 1 2 5 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Happisburgh, England*

Data type *6255 hourly medians*, Distance *203.2* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ____ km

Frequency *560* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	60.6	24.4
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	52°49'42"N
longitude	4°16'E	1°31'38"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.145

Figure 165. Path 11987, parameters.

Path Number: _ _ _ 1 2 1 0 9

Code Number: 1 1 2 5 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Happisburgh, England*

Data type *9340 hourly medians*, Distance *203.2* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *560* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	24.4
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	52°49'42"N
longitude	4°16'E	1°31'38"E
Path bearing		
elevation [m-msl]		

Other information:

CT/TRER 16, fig. 3.145

Figure 166. Path 12109, parameters.

Path Number: _ _ _ 1 2 0 8 5

Code Number: 1 1 2 7 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Happisburgh, England*

Data type *1119 hourly medians*, Distance *203.2* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *774* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	24.4
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	52°49'42"N
longitude	4°16'E	1°31'38"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.145

Figure 167. Path 12085, parameters.

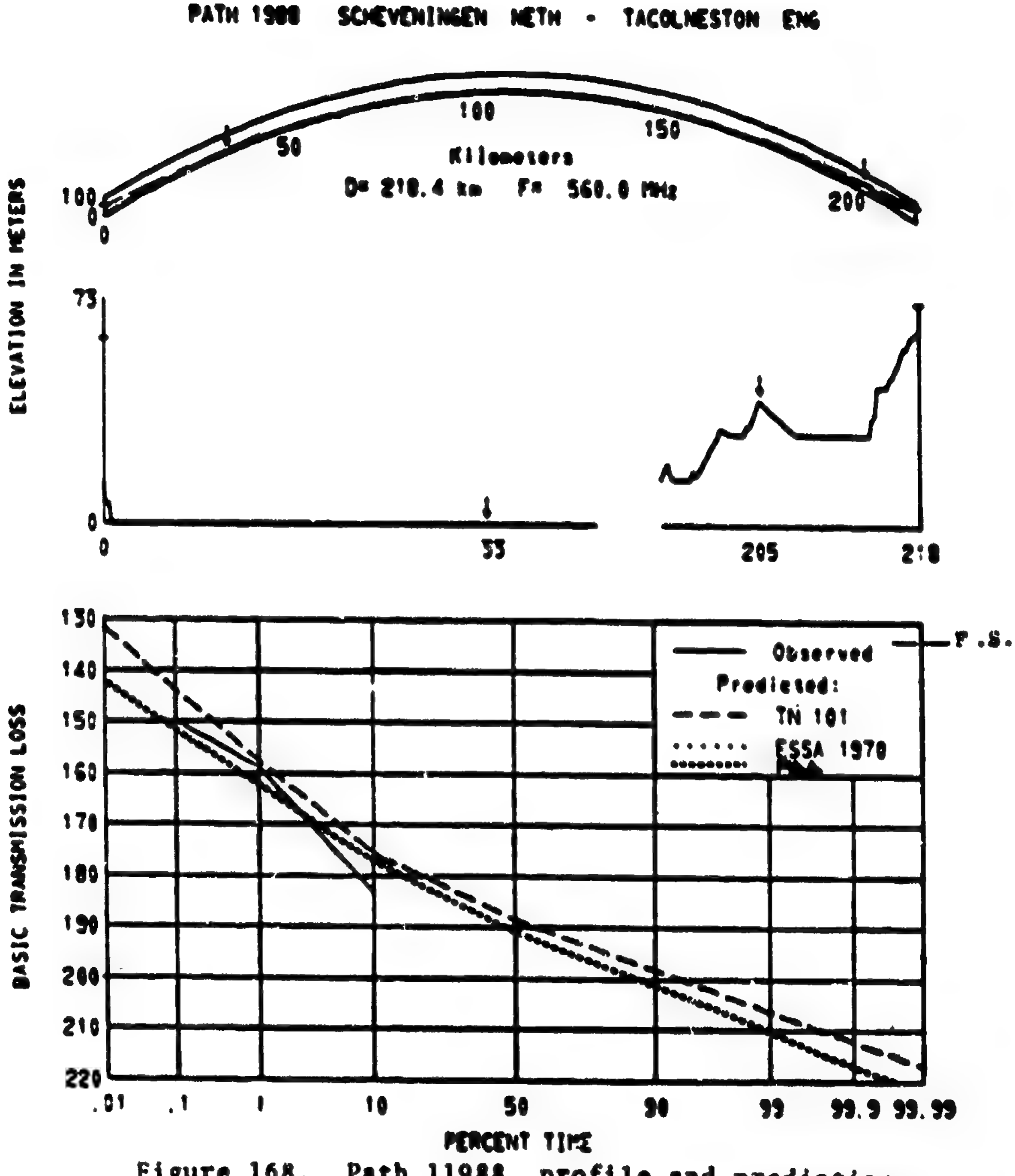


Figure 168. Path 11988, profile and predictions.

Path Number: _ _ _ 1 1 9 8 8

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Tacolneston, England*

Data type *6254 hourly medians*, Distance *218.4* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *560* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *16.7* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	60.6	73.1
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		13.7
elevation [m-msl]		41
elevation angle [deg]		
Location, latitude	52°06'N	52°31'03"N
longitude	4°16'E	1°08'25"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.146

Figure 169. Path 11988, parameters.

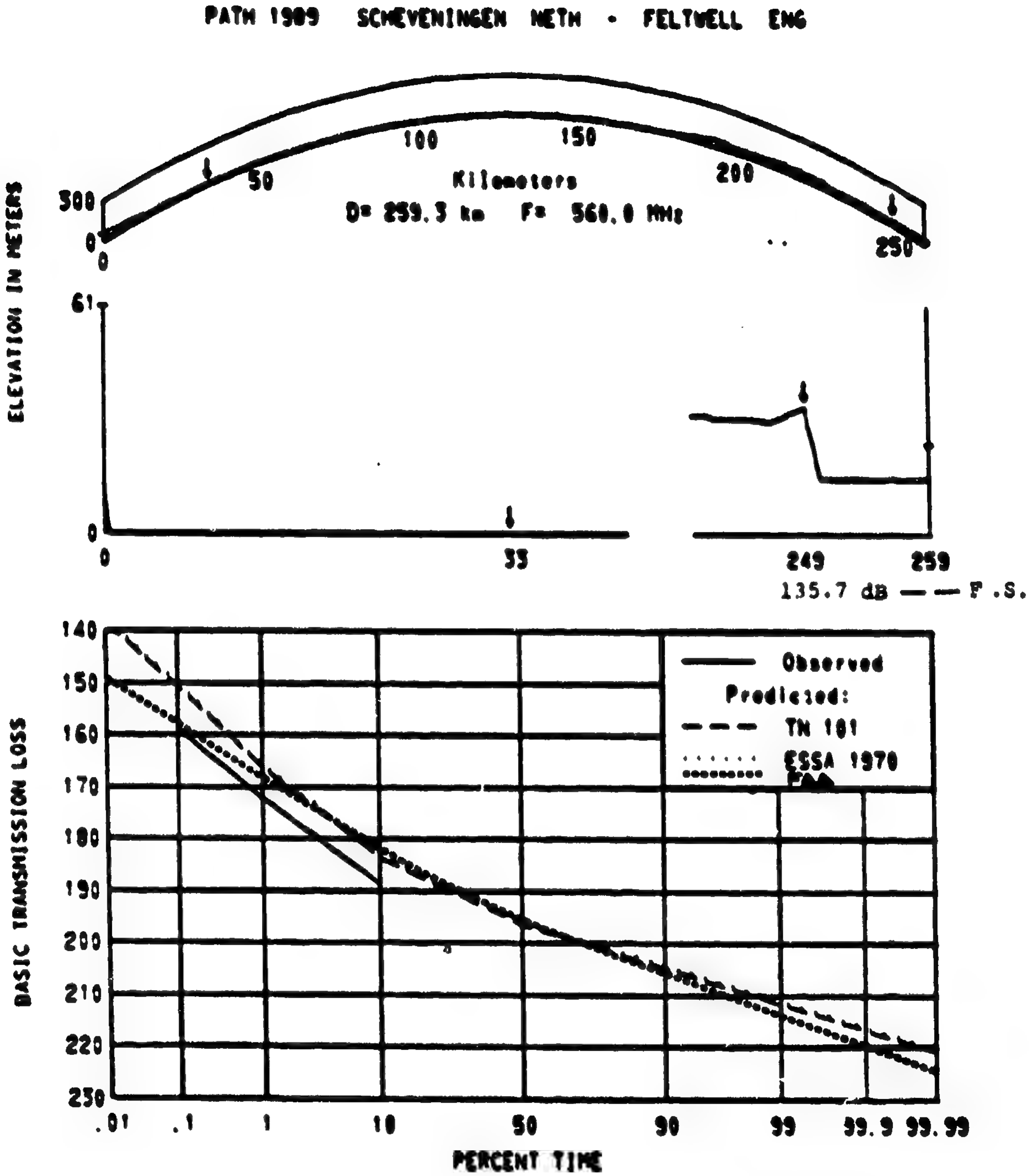


Figure 170. Path 11989, profile and predictions.

Path Number: _ _ _ 1 1 9 8 9

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Feltwell, England*

Data type *5849 hourly medians*, Distance *259.3* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *560* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *30.6* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	60.6	24.3
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		10.1
elevation [m-msl]		34
elevation angle [deg]		
Location, latitude	52°06'N	52°28'50"N
longitude	4°16'E	0°31'15"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.147

Figure 171. Path 11989, parameters.

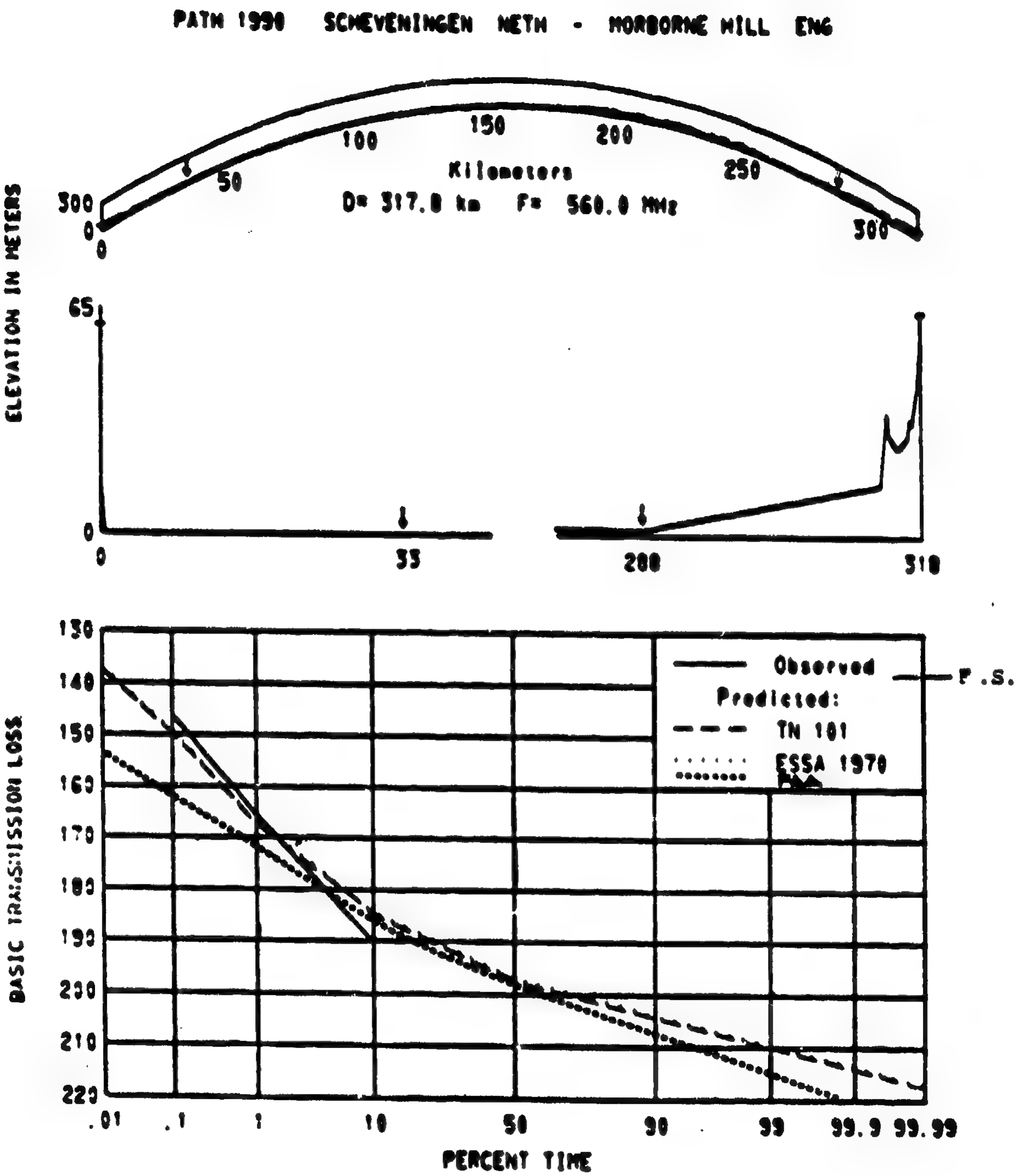


Figure 172. Path 11990, profile and predictions.

Path Number: _ _ _ 1 1 9 9 0

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 4 1 1

Location: Scheveningen, Netherlands - Morborne Hill, England

Data type 5630 hourly medians, Distance 317.8 km, h_{rs} 1.5 m-msl

N_s 318 N-units, a 8784 km, Surface type average ground

Climate maritime temperate overland, de ______ km

Frequency 560 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 36.9 m, θ ______ mr.

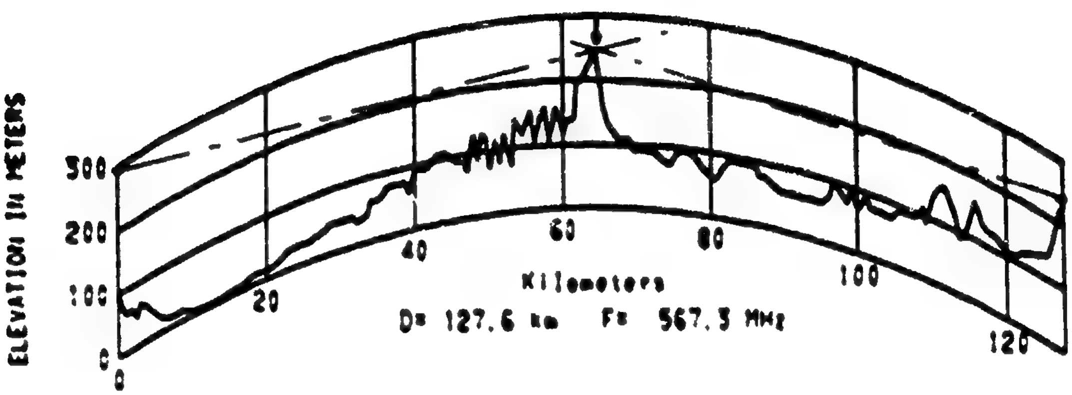
	Transmitter	Receiver
Antenna elevation [m-msl]	60.6	65.2
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		30.3
elevation [m-msl]		1.5
elevation angle [deg]		
Location, latitude	52°06'N	52°30'26"N
longitude	4°16'E	0°20'30"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.148

Figure 173. Path 11990, parameters.

PATH 1998 CRYSTAL PALACE ENG - STOW ON THE WOLD ENG



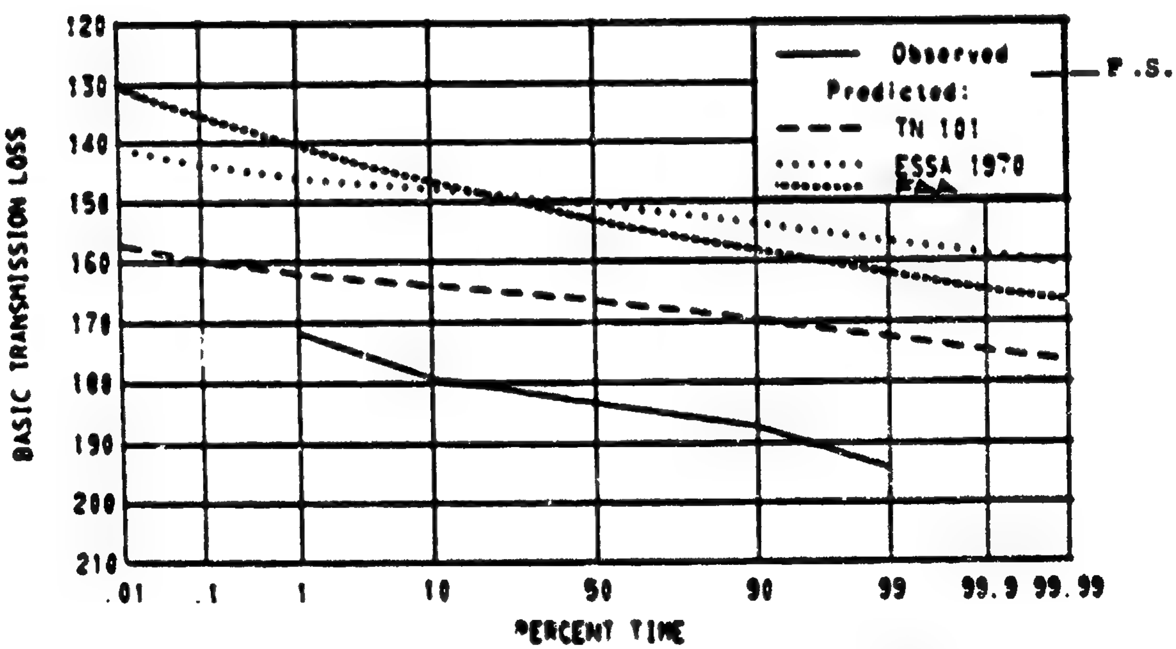


Figure 174. Path 11998, profile and predictions.

Path Number: _ _ _ 1 1 9 9 8

Code Number: 1 1 2 5 2 1 0 4 5 2 1 1 3 1 1 1

Location: Crystal Palace, England - Stow on the Wold, England

Data type 6000 hourly medians, Distance 127.6 km, h_{rs} 100 m-msl

N_s 313 N-units, a 8694 km, Surface type average ground

Climate maritime temperate overland, de ______ km

Frequency 567.2 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 84.9 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	294.1	240.7
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		62.89
elevation [m-msl]		245.4
elevation angle [deg]		
Location, latitude	51°25'20"N	51°55'42"N
longitude	0°04'17"W	1°43'30"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.11

Figure 175. Path 11998, parameters.

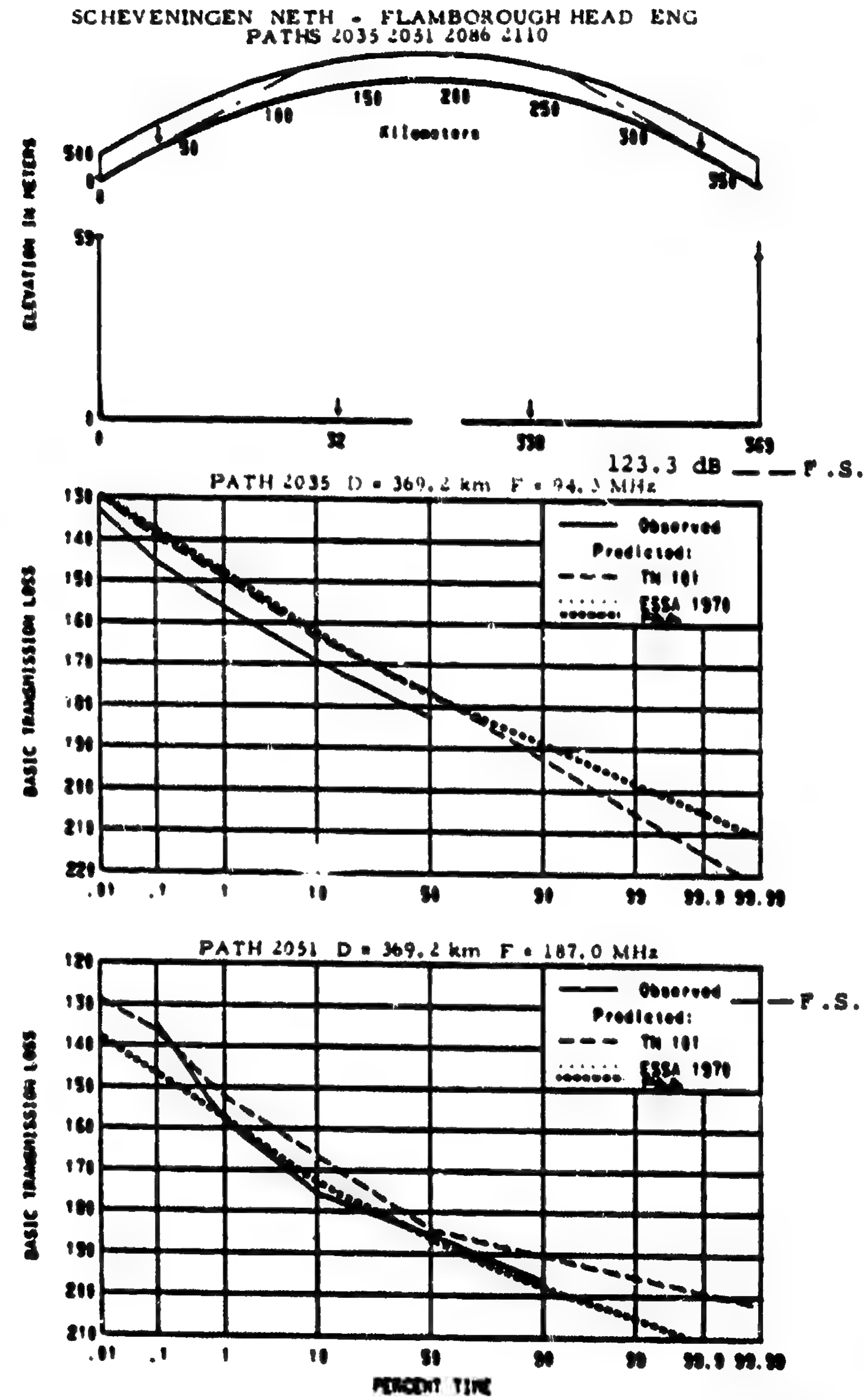


Figure 176. Paths 12035 and 12051, profile and predictions.

Path Number: _ _ _ 1 2 0 3 5

Code Number: 1 1 2 0 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Flamborough Head, England*

Data type *5589 hourly medians*, Distance *369.2* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *seawater*

Climate *maritime temperate oversea*, de ______ km

Frequency *94.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	54.9
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	54°07'39"N
longitude	4°16'E	0°05'40"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.150

Figure 177. Path 12035, parameters.

Path Number: _ _ _ 1 2 0 5 1

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Flamborough Head, England*

Data type *6819 hourly medians*, Distance *369.2* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *seawater*

Climate *maritime temperate oversea*, de ___ km

Frequency *187* MHz, Transmitter output ___ dBW, EIRP ___ dBW

Δh *0* m, θ ___ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	54.9
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	54°07'39"N
longitude	4°16'E	0°05'40"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.150

Figure 178. Path 12051, parameters.

SCHEVENINGEN NETH - FLAMBOROUGH HEAD ENG

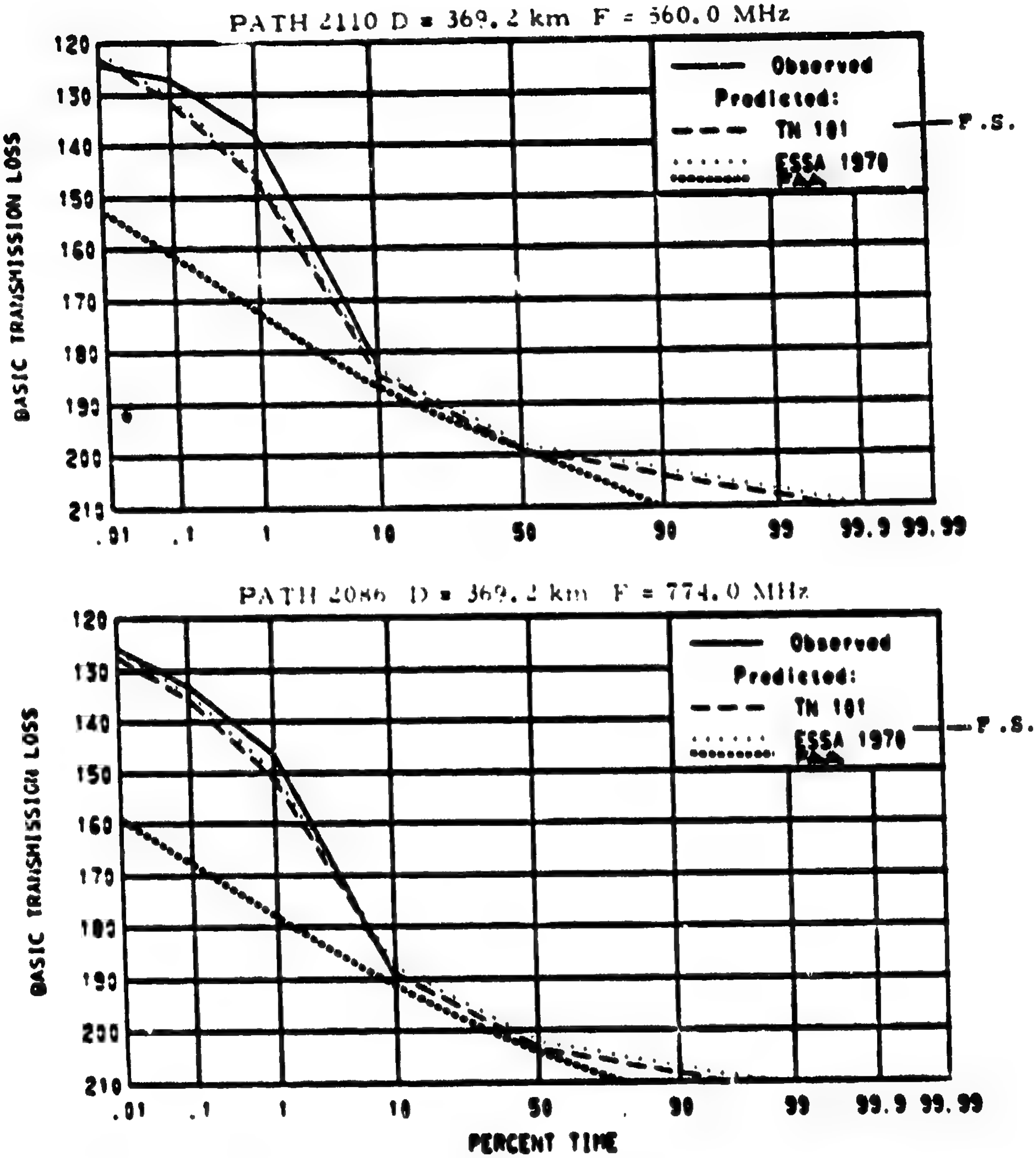


Figure 179. Paths 12110 and 12086, predictions.
(see Figure 176 for profile)

Path Number: _ _ _ 1 2 1 1 0

Code Number: 1 1 2 5 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Flamborough Head, England*

Data type *9603 hourly medians*, Distance *369.2* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *seawater*

Climate *maritime temperate oversea*, de ______ km

Frequency *560* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	54.9
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	54°07'39"N
longitude	4°16'E	0°05'40"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.151

Figure 180. Path 12110, parameters.

Path Number: _ _ _ 1 2 0 8 6

Code Number: 1 1 2 7 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Flamborough Head, England*

Data type *1123 hourly medians*, Distance *369.2* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *seawater*

Climate *maritime temperate oversea*, de ___ km

Frequency *774* MHz, Transmitter output ___ dBW, EIRP ___ dBW

Δh *0* m, θ ___ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	54.9
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	54°07'39"N
longitude	4°16'E	0°05'40"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.151

Figure 181. Path 12086, parameters.

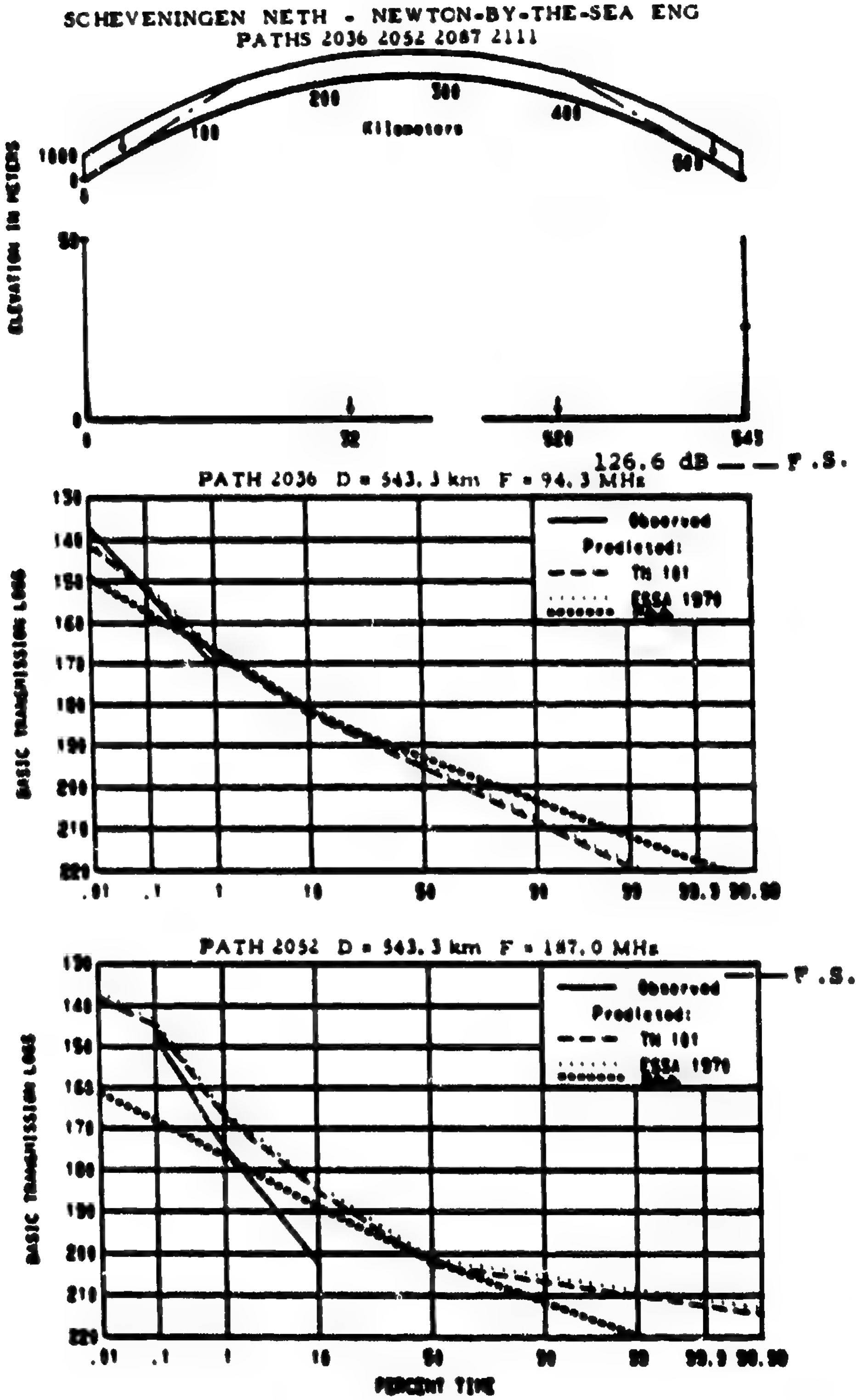


Figure 182. Paths 12036 and 12052, profile and predictions.

Path Number: _ _ _ 1 2 0 3 6

Code Number: 1 1 2 0 3 0 0 4 5 3 1 1 3 4 1 1

Location: Scheveningen, Netherlands - Newton by the Sea, England

Data type 5541 hourly medians, Distance 543.3 km, h_{rs} 0 m-msl

N_s 317 N-units, a 8766 km, Surface type seawater

Climate maritime temperate oversea, de ______ km

Frequency 94.4 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 0 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	30.5
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	55°31'06"N
longitude	4°16'E	1°37'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.153

Figure 183. Path 12036, parameters.

Path Number: _ _ _ 1 2 0 5 2

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 3 4 1 1

Location: Scheveningen, Netherlands - Newton by the Sea, England

Data type 6010 hourly medians, Distance 543.3 km, h_{rs} 0 m-msl

N_s 317 N-units, a 8766 km, Surface type seawater

Climate maritime temperate oversea, de ______ km

Frequency 187 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 0 m, θ ______ mr.

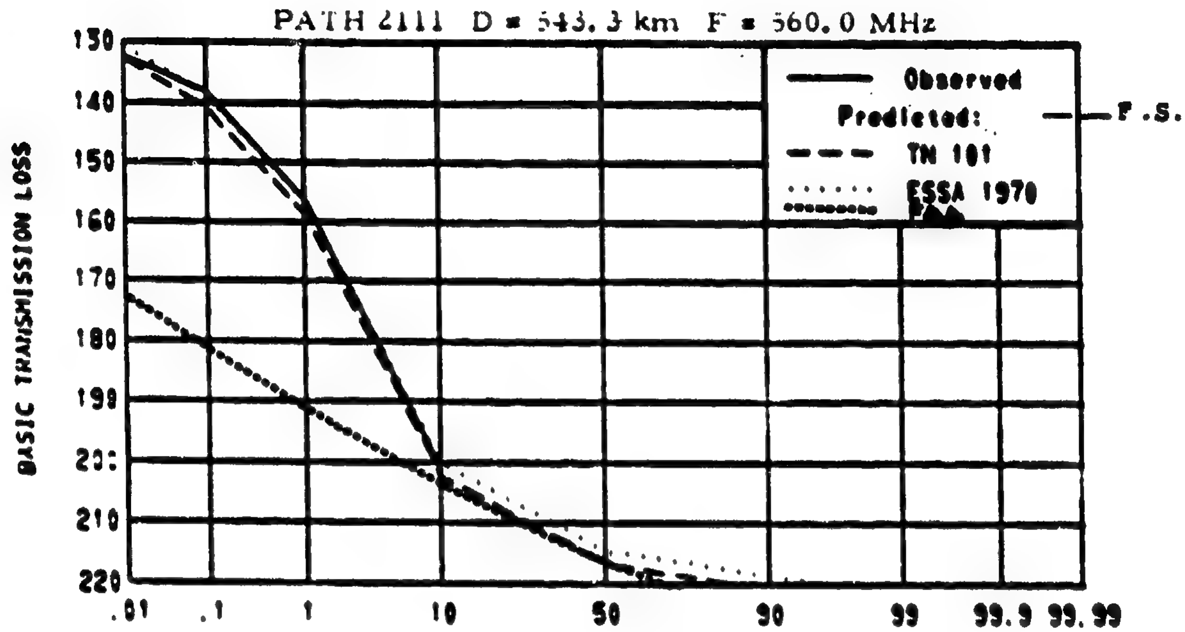
	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	30.5
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	55°31'06"N
longitude	4°16'E	1°37'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.153

Figure 184. Path 12052, parameters.

SCHEVENINGEN NETH - NEWTON-BY-THE-SEA ENG



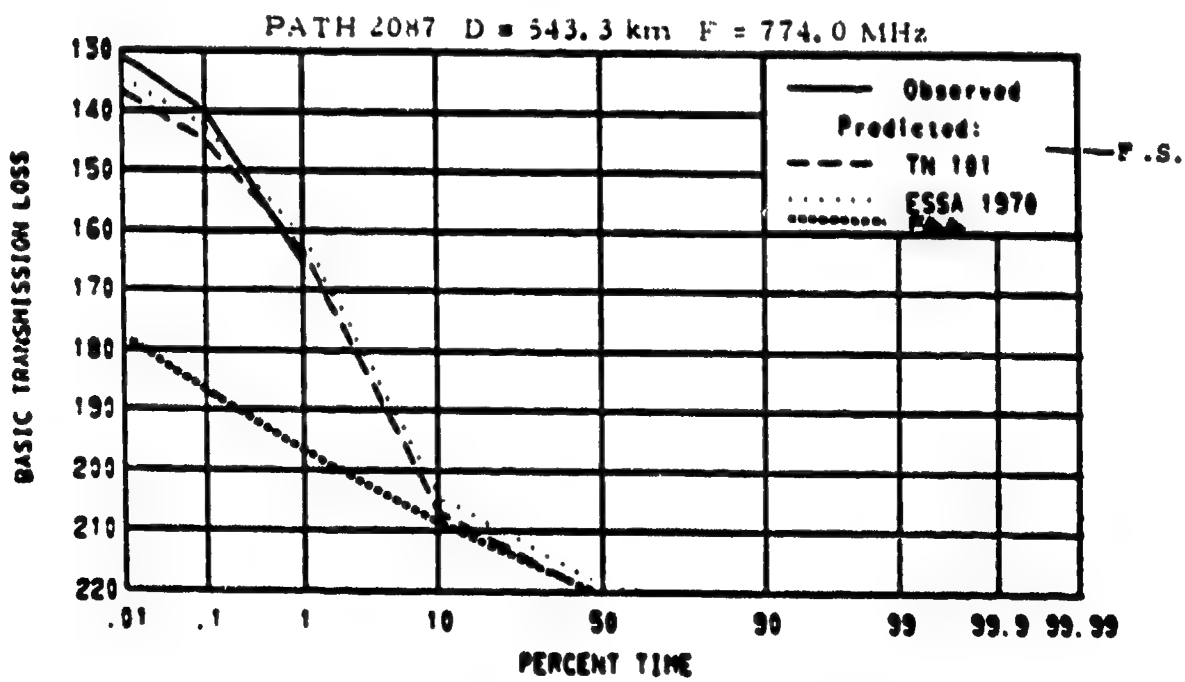


Figure 185. Paths 12111 and 12087, predictions.
(see Figure 182 for profile)

Path Number: _ _ _ 1 2 1 1 1

Code Number: 1 1 2 5 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Newton by the Sea, England*

Data type *8862 hourly medians*, Distance 543.3 km, h_{rs} 0 m-msl

N_s 317 N-units, a 8766 km, Surface type *seawater*

Climate *maritime temperate oversea*, de ________ km

Frequency 560 MHz, Transmitter output ________ dBW, EIRP ________ dBW

Δh 0 m, θ ________ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	30.5
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	55°31'06"N
longitude	4°16'E	1°37'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.154

Figure 186. Path 12111, parameters.

Path Number: _ _ _ 1 2 0 8 7

Code Number: 1 1 2 7 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Newton by the Sea, England*

Data type *1059 hourly medians*, Distance 543.3 km, h_{rs} 0 m-msl

N_s *317* N-units, a *8766* km, Surface type *seawater*

Climate *maritime temperate oversea*, de ______ km

Frequency *774* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	30.5
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	55°31'06"N
longitude	4°16'E	1°37'05"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.154

Figure 187. Path 12087, parameters.

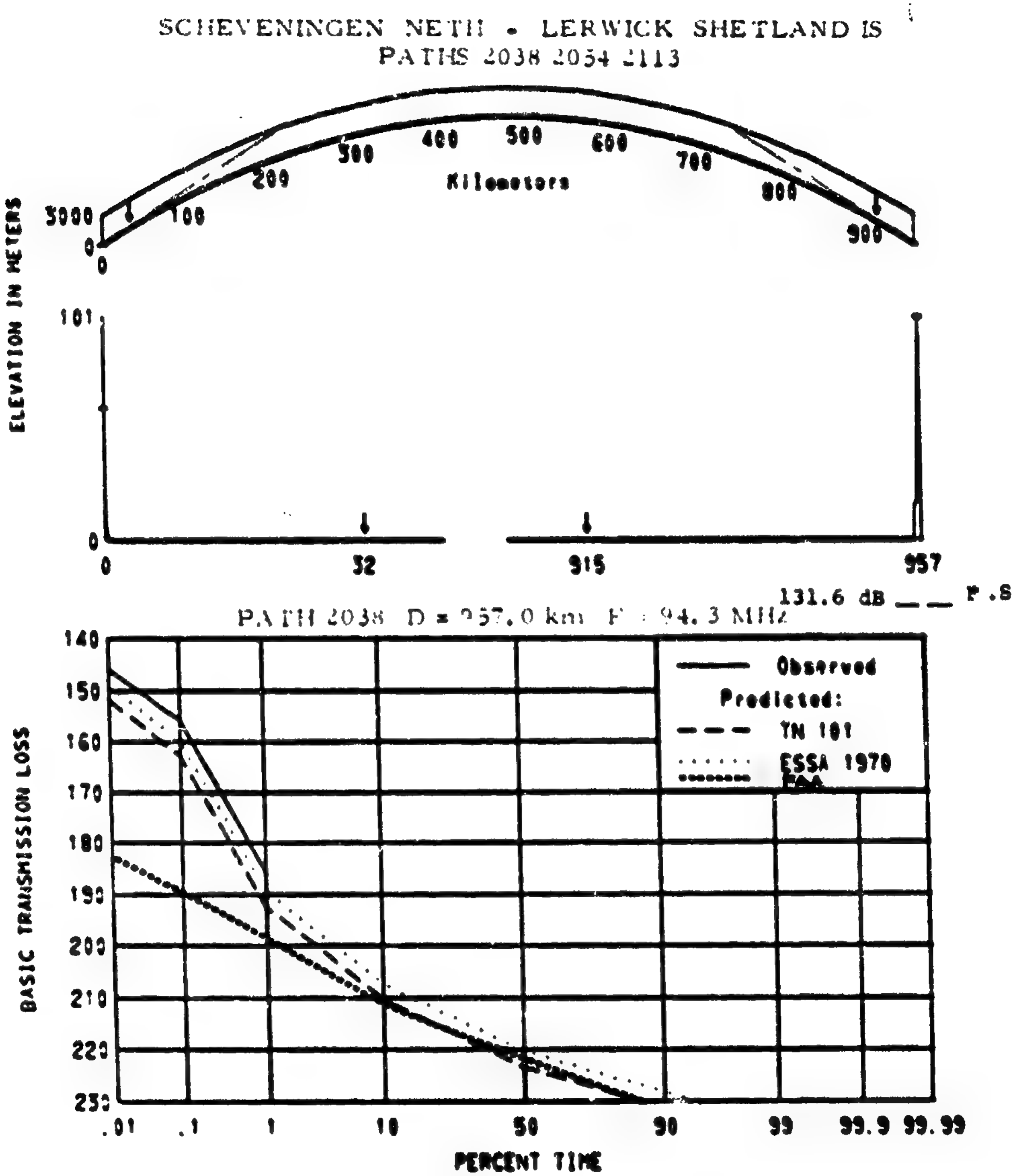


Figure 188. Path 12038, profile and predictions.

Path Number: _ _ _ 1 2 0 3 8

Code Number: 1 1 2 0 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Lerwick, Shetland Islands*

Data type *5679 hourly medians*, Distance *957.0* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *seawater*

Climate *maritime temperate oversea*, de ______ km

Frequency *94.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	100.6
gain [dBi], main beam		
height [m], above site surface	46	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	60°08'11"N
longitude	4°16'E	1°10'46"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.156

Figure 189. Path 12038, parameters.

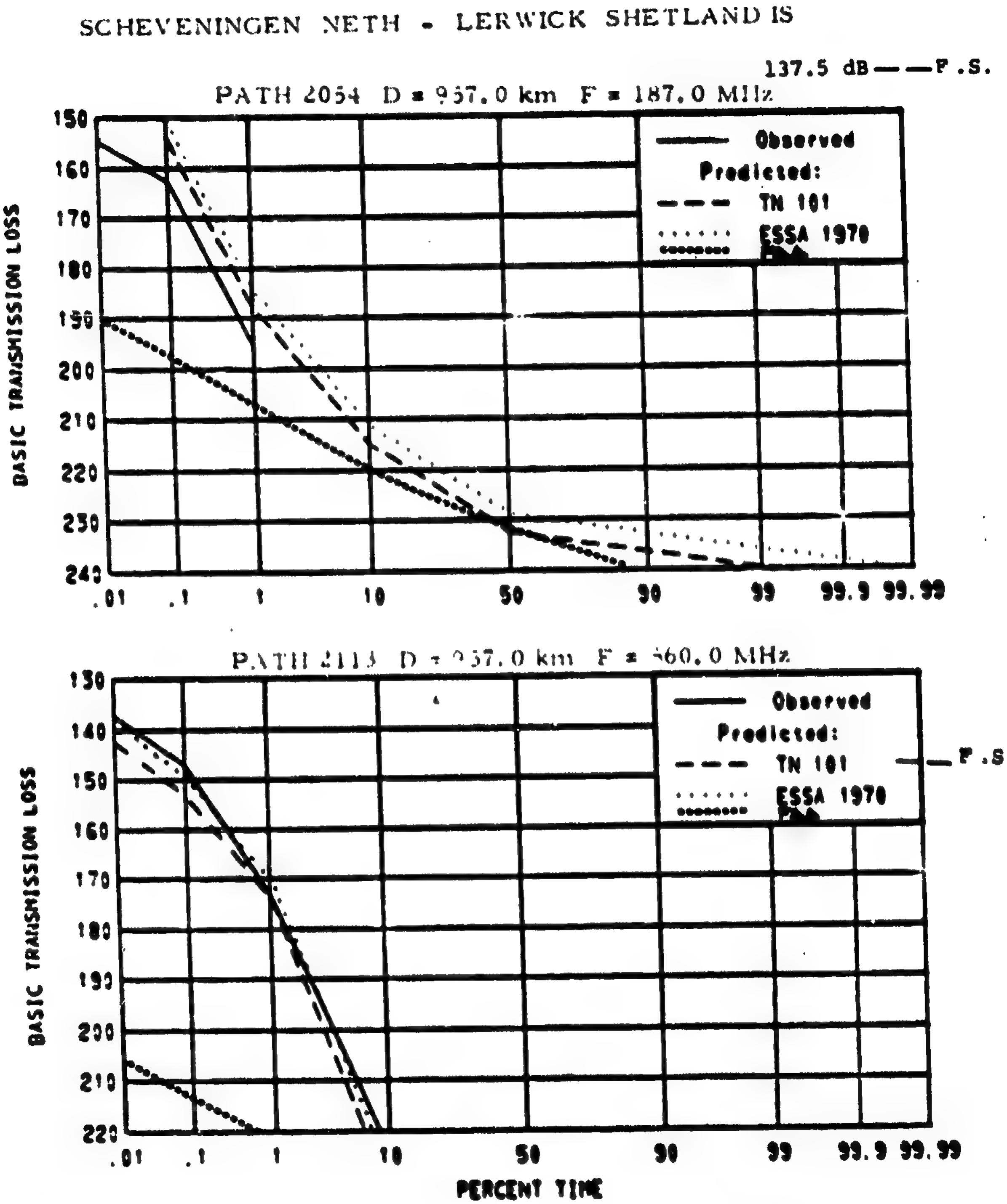


Figure 190. Paths 12054 and 12113, predictions.
(see Figure 188 for profile)

Path Number: _ _ _ 1 2 0 5 4

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Lerwick, Shetland Islands*

Data type *6845 hourly medians*, Distance *957.0* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *seawater*

Climate *maritime temperate oversea*, de ______ km

Frequency *187* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	100.6
gain [dBi], main beam		
height [m], above site surface	46	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	60°08'11"N
longitude	4°16'E	1°10'46"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.157

Figure 191. Path 12054, parameters.

Path Number: _ _ _ 1 2 1 1 3

Code Number: 1 1 2 5 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Lerwick, Shetland Islands*

Data type *9696 hourly medians*, Distance *957.0* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *560* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	100.6
gain [dBi], main beam		
height [m], above site surface	46	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	60°08'11N
longitude	4°16'E	1°10'46"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.157

Figure 192. Path 12113, parameters.

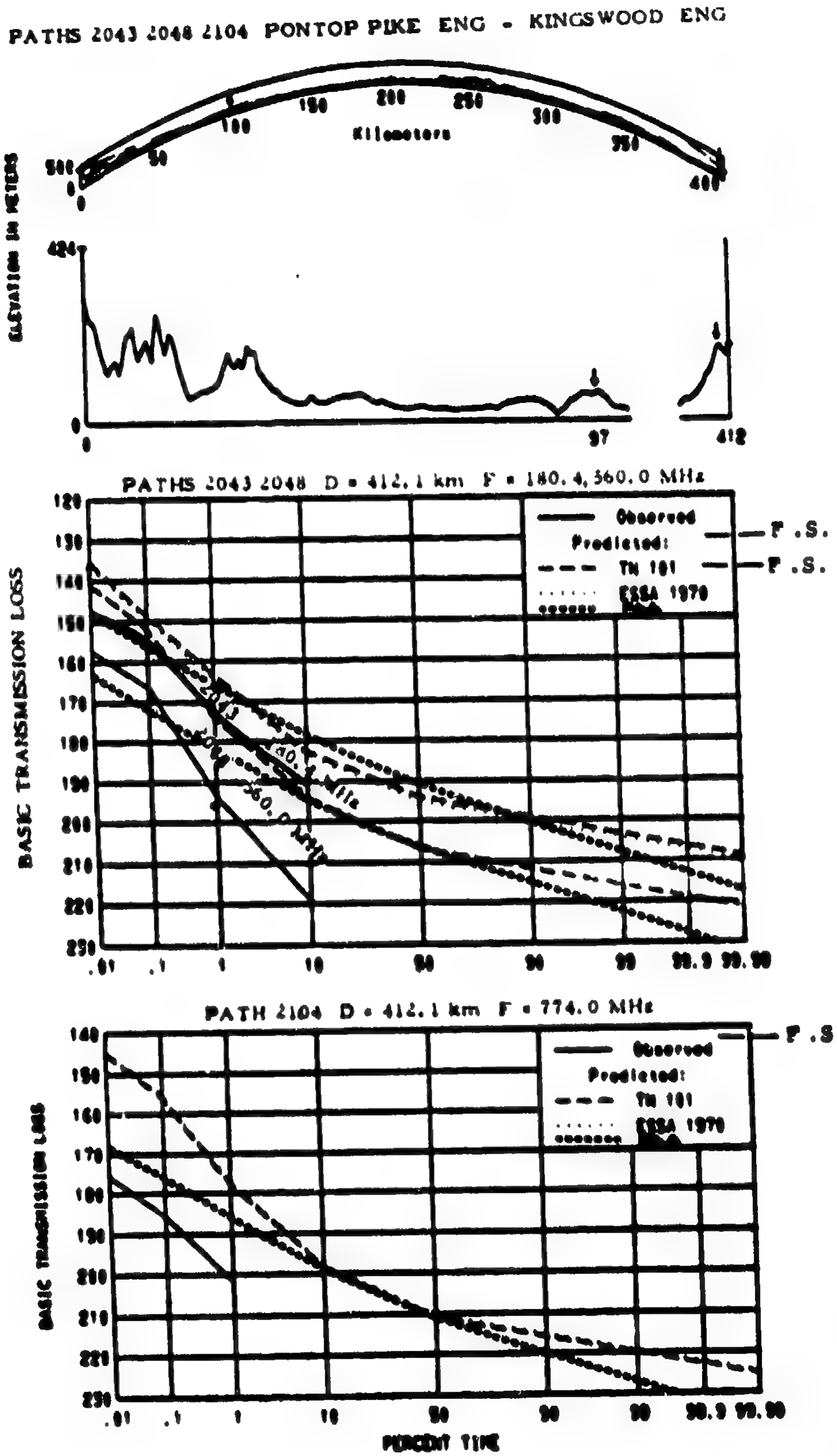


Figure 103. Paths 12043, 12048, and 12104, profile and predictions.

Path Number: _ _ _ 1 2 0 4 3

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Pontop Pike, England - Kingswood, England*

Data type *3197 hourly medians*, Distance *412.1* km, h_{rs} *67.1* m-msl

N_s *316* N-units, a *8747* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *180.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *128* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	424.3	176.2
gain [dBi], main beam		
height [m], above site surface		8.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		2.25
elevation [m-msl]		176.5
elevation angle [deg]		
Location, latitude	54°52'08"N	51°17'20"N
longitude	1°46'11"W	0°12'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.125

Figure 194. Path 12043, parameters.

Path Number: _ _ _ 1 2 0 4 8

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 1 1 1

Location: Pontop Pike, England - Kingswood, England

Data type 3545 hourly medians, Distance 412.1 km, h_{rs} 67.1 m-msl

N_s 316 N-units, a 8747 km, Surface type average ground

Climate maritime temperate overland, de ______ km

Frequency 560 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 128 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	430.4	176.2
gain [dBi], main beam		
height [m], above site surface		8.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		2.25
elevation [m-msl]		176.5
elevation angle [deg]		
Location, latitude	54°52'08"N	51°17'20"N
longitude	1°46'11"W	0°12'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.125

Figure 195. Path 12048, parameters.

Path Number: _ _ _ 1 2 1 0 4

Code Number: 1 1 2 7 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Pontop Pike, England - Kingswood, England*

Data type *8728 hourly medians*, Distance *412.1* km, h_{rs} *67.1* m-msl

N_s *316* N-units, a *8747* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *774* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *128* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	427.3	176.2
gain [dBi], main beam		
height [m], above site surface		8.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		2.25
elevation [m-msl]		176.5
elevation angle [deg]		
Location, latitude	54°52'08"N	51°17'20"N
longitude	1°46'11"W	0°12'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.125

Figure 196. Path 12104, parameters.

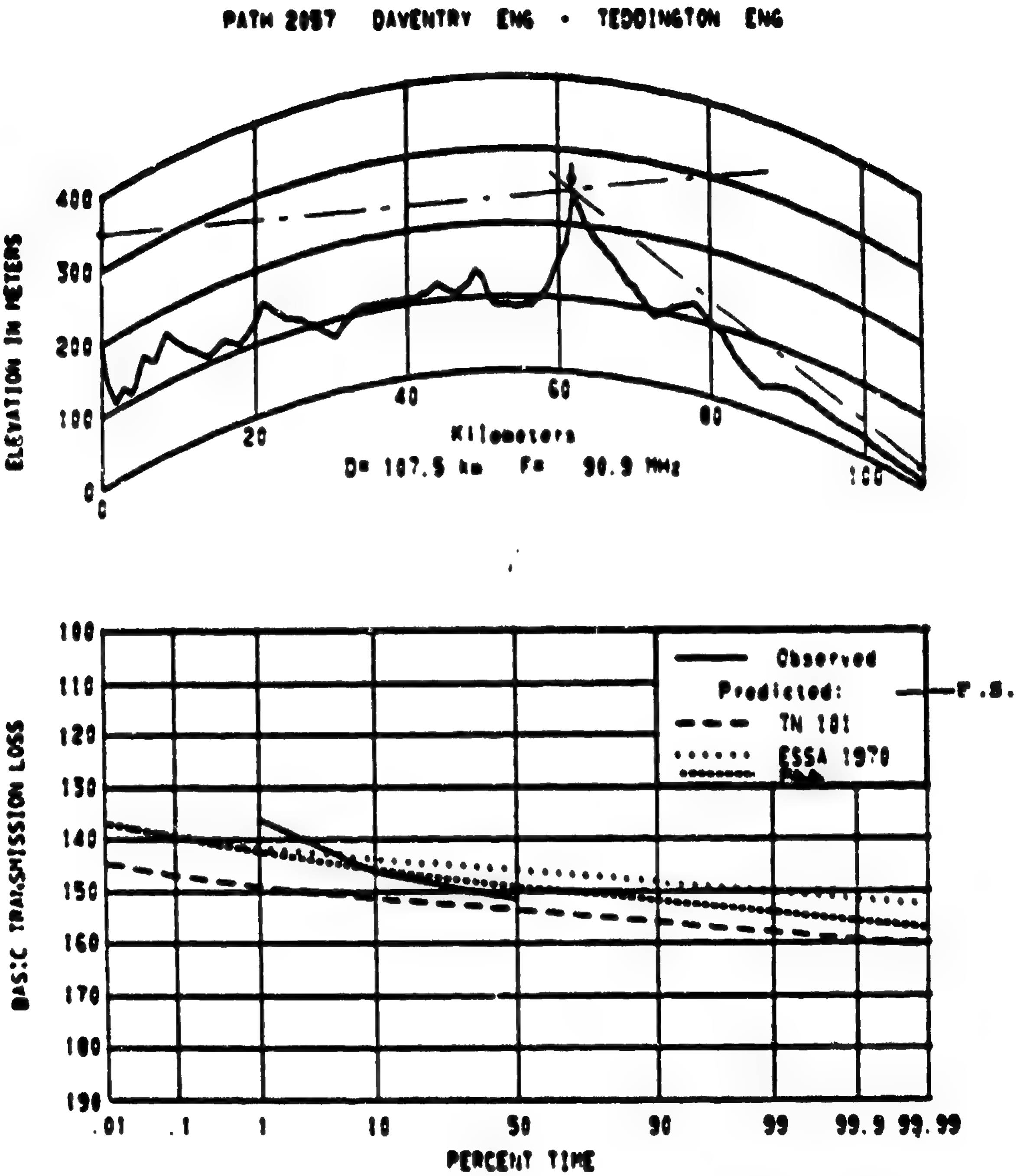


Figure 197. Path 12057, profile and predictions.

Path Number: _ _ _ 1 2 0 5 7

Code Number: 1 1 2 0 2 1 0 4 5 2 1 1 3 1 1 1

Location: *Daventry, England - Teddington, England*

Data type *6000 hourly medians*, Distance 107.5 km, h_{rs} 9 m-msl

N_s 313 N-units, a 8694 km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency 90.9 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 83.6 m, θ ______ mr.

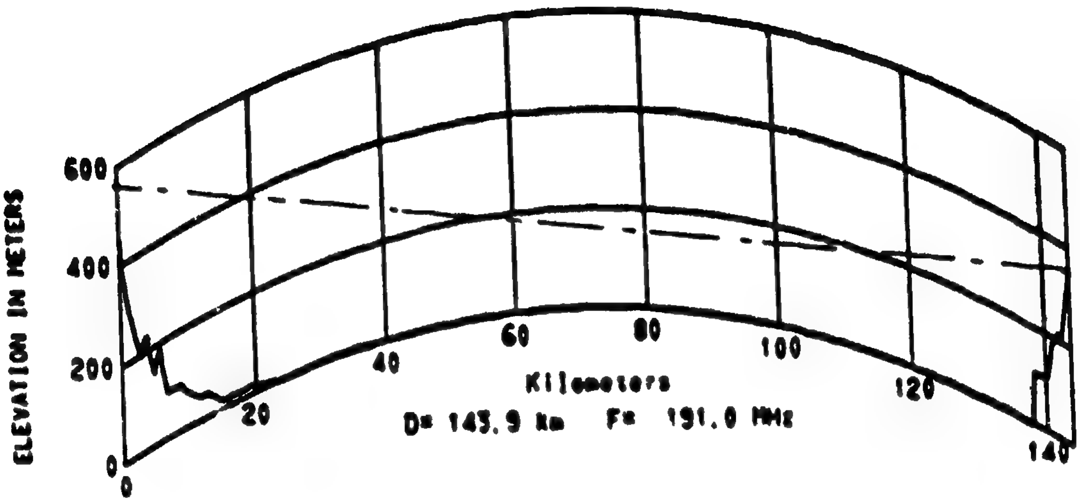
	Transmitter	Receiver
Antenna elevation [m-msl]	349.9	27.0
gain [dBi], main beam		
height [m], above site surface		18.0
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		45.69
elevation [m-msl]		245.4
elevation angle [deg]		
Location, latitude	52°14'32"N	51°25'24"N
longitude	1°09'24"W	0°19'54"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.7

Figure 198. Path 12057, parameters.

PATHS 2075 2151 WINTER HILL ENG - DOUGLAS ISLE OF MAN



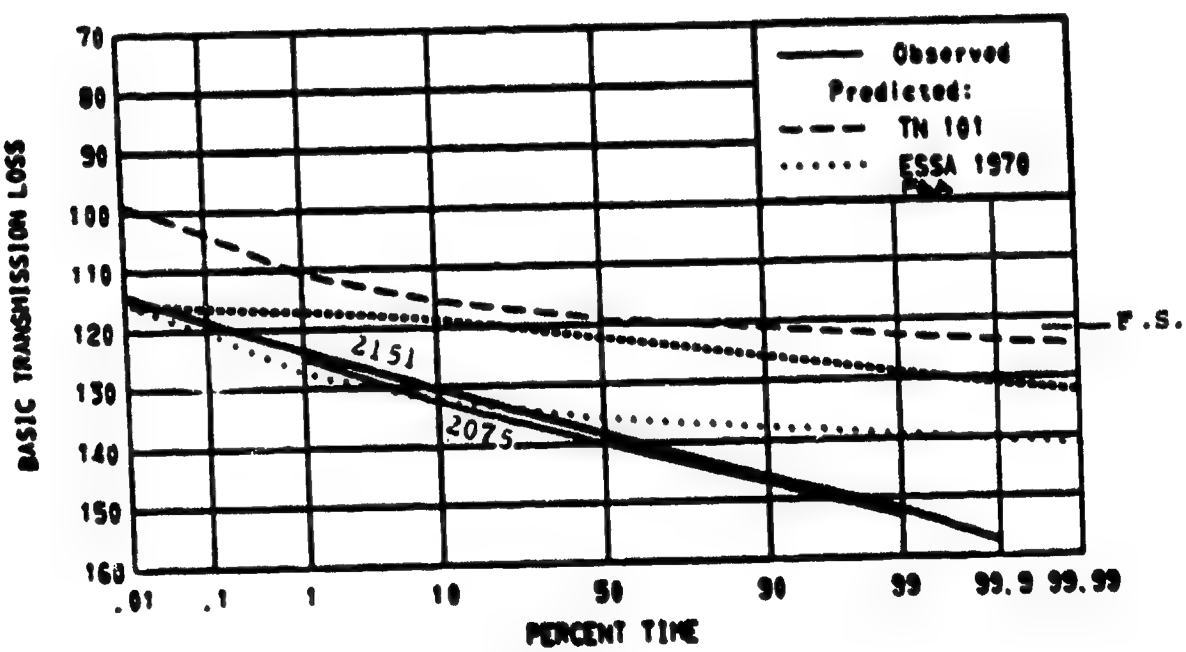


Figure 199. Paths 12075 and 12151, profile and predictions.

Path Number: _ _ _ 1 2 0 7 5

Code Number: 1 1 2 1 1 0 0 4 5 3 1 1 3 1 1 1

Location: *Winter Hill, England - Douglas (high site) Isle of Man*

Data type *5 months of hourly medians*, Distance *143.9* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *191* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	563.9	356.6
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		143.9
elevation [m-msl]		457.2
elevation angle [deg]		
Location, latitude	53°37'44"N	54°12'50"N
longitude	2°30'55"W	4°28'00"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.24

Figure 200. Path 12075, parameters.

Path Number: _ _ _ _ 1 2 1 5 1

Code Number: 1 1 2 1 1 0 0 4 5 3 1 1 3 1 1 1

Location: *Winter Hill, England - Douglas (high site) Isle of Man*

Data type *4200 hourly medians*, Distance *143.9* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *191.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	580	357.5
gain [dBi], main beam		
height [m], above site surface		10
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		143.9
elevation [m-msl]		457.2
elevation angle [deg]		
Location, latitude	53°37'44"N	54°12'50"N
longitude	2°30'55"W	4°28'00"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.24

Figure 201. Path 12151, parameters.

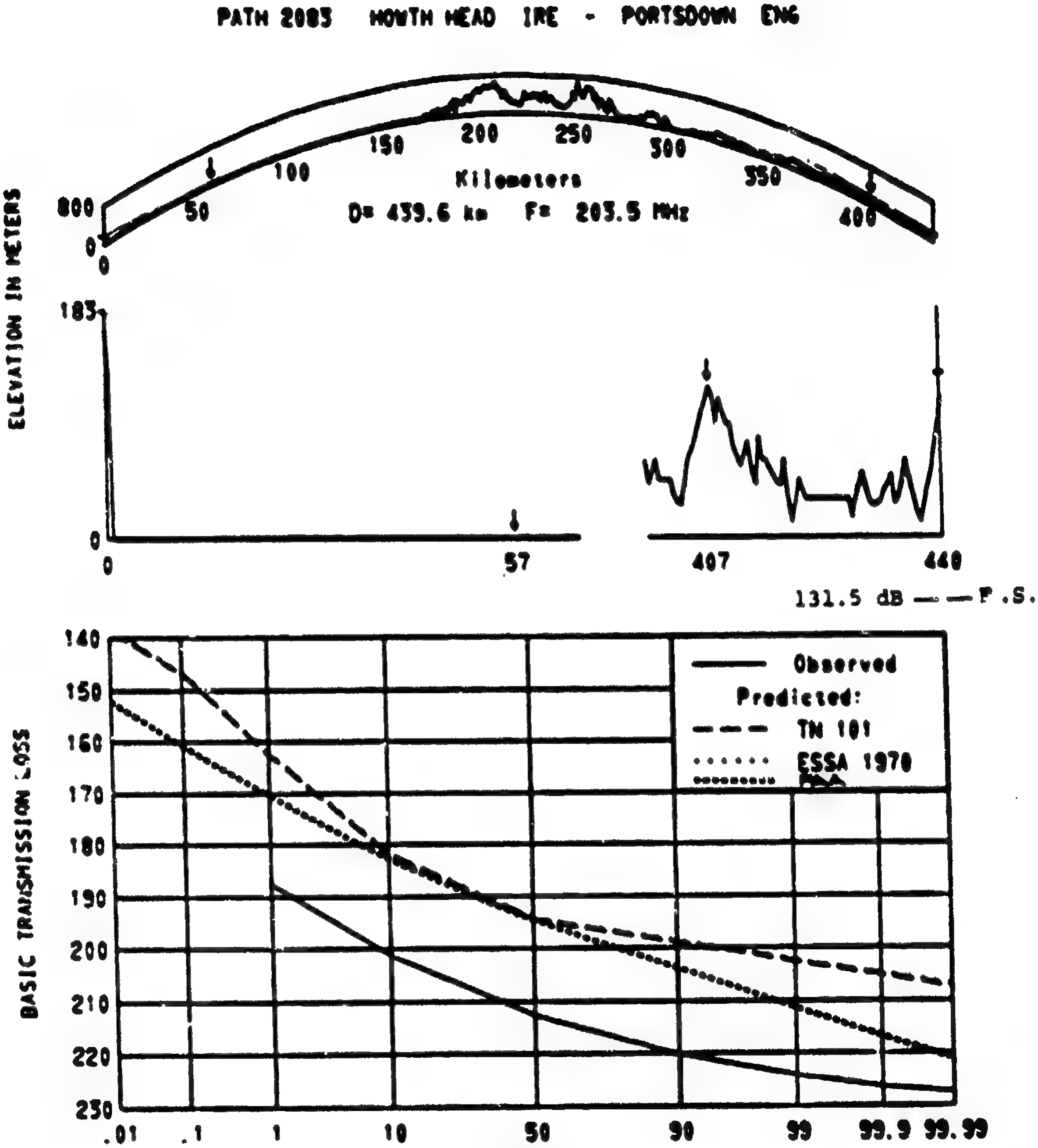


Figure 202. Path 12083, profile and predictions.

Path Number: _ _ _ 1 2 0 8 3

Code Number: 1 1 2 2 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Howth Head, Ireland - Portsdown, England*

Data type *277 hourly medians*, Distance *439.6* km, h_{rs} *0* m-msl

N_s *320* N-units, a *8822* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *203.5* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *330.5* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	182.9	131.1
gain [dBi], main beam		
height [m], above site surface		19.8
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		32.5
elevation [m-msl]		120.4
elevation angle [deg]		
Location, latitude	53°22'21"N	50°51'30"N
longitude	6°04'04"W	1°07'16"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.128

Figure 203. Path 12083, parameters.

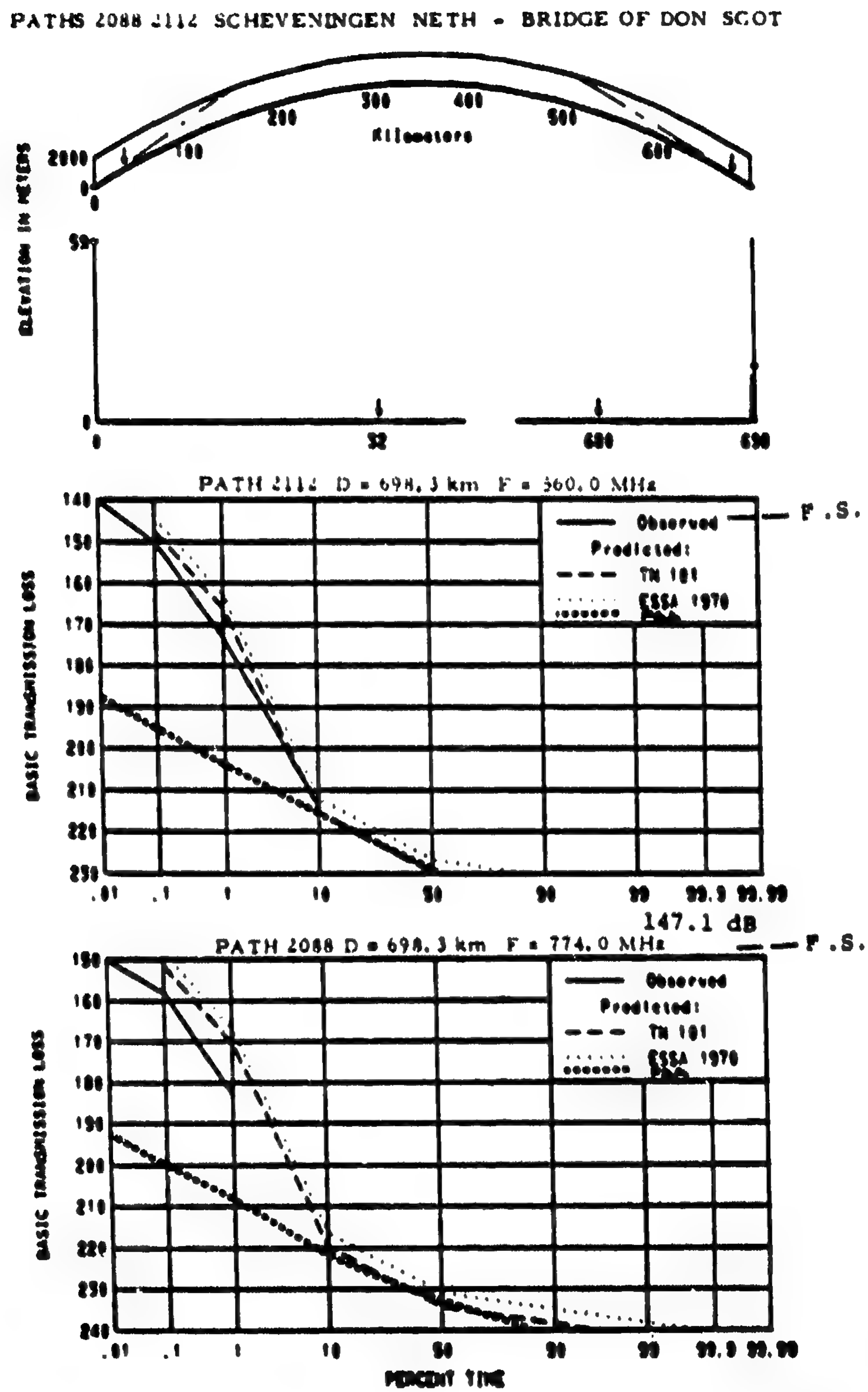


Figure 204. Paths 12112 and 12088, profile and predictions.

Path Number: _ _ _ 1 2 1 1 2

Code Number: 1 1 2 5 3 7 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Bridge of Don, Scotland*

Data type *9783 hourly medians*, Distance *698.3* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *560* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	18.3
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	57°10'40"N
longitude	4°16'E	2°05'00"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.155

Figure 205. Path 12112, parameters.

Path Number: _ _ _ 1 2 0 8 8

Code Number: 1 1 2 7 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Scheveningen, Netherlands - Bridge of Don, Scotland*

Data type *1124 hourly medians*, Distance *698.3* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *774* MHz, Transmitter output ______ dBW, EIRP ______ dBW

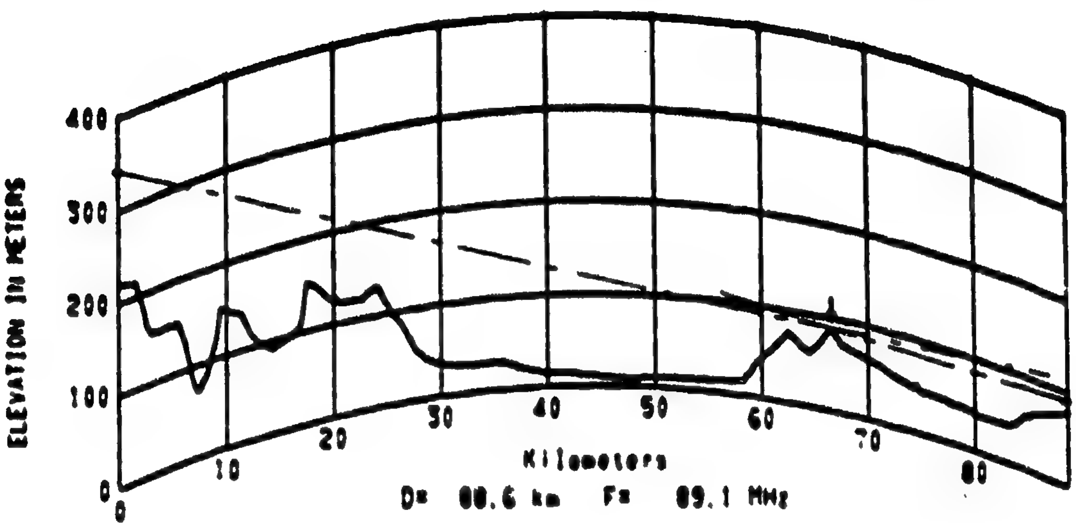
Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.4	18.3
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	57°10'40"N
longitude	4°16'E	2°05'00"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.155

Figure 206. Path 12088, parameters.



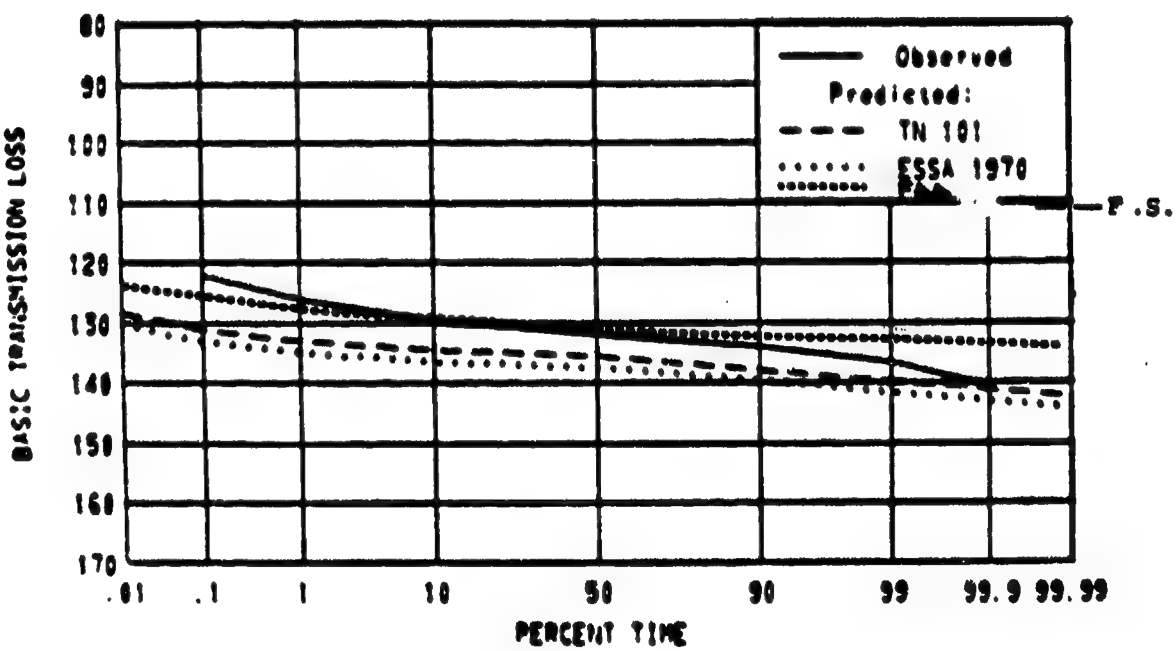


Figure 207. Path 12091, profile and predictions.

Path Number: ___ ___ ___ 1 2 0 9 1

Code Number: 1 1 2 0 2 1 0 4 5 2 1 1 3 1 1 1

Location: *Wrotham, England - Caversham, England*

Data type *2598 hourly medians*, Distance *88.6* km, h_{rs} *15* m-msl

N_s *318* N-units, a *8784* km, Surface type *average ground*

Climate *maritime temperate overland*, de ________ km

Frequency *89.1* MHz, Transmitter output ________ dBW, EIRP ________ dBW

Δh *112.9* m, θ ________ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	342.9	91.4
gain [dBi], main beam		
height [m], above site surface		13.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		21.89
elevation [m-msl]		88.4
elevation angle [deg]		
Location, latitude	51°19'11"N	51°28'52"N
longitude	0°17'20"E	0°57'23"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.4

Figure 208. Path 12091, parameters.

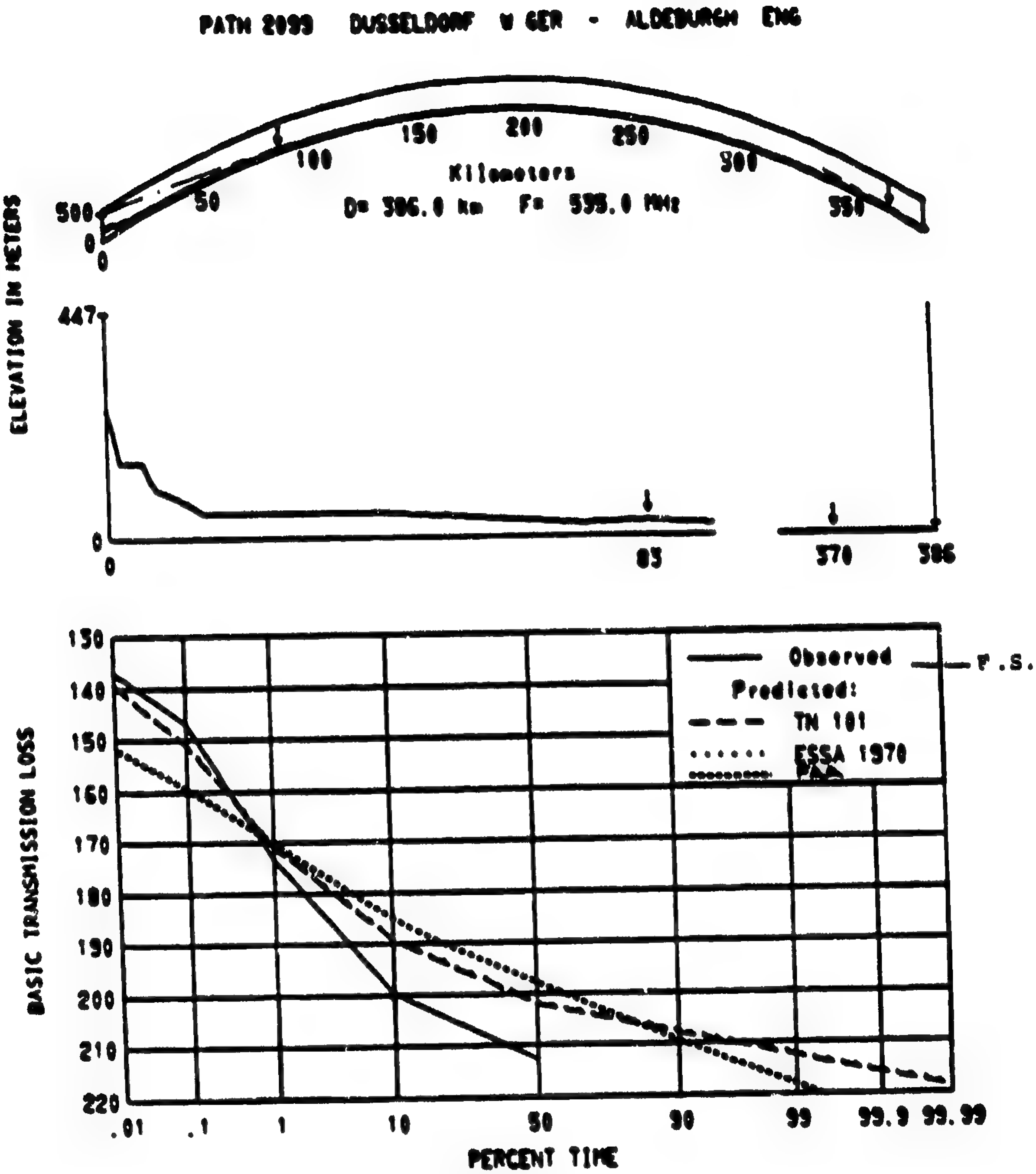


Figure 209. Path 12099, profile and predictions.

Path Number: _ _ _ 1 2 0 9 9

Code Number: 1 1 2 5 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Dusseldorf, West Germany - Aldeburgh, England*

Data type *1500 hourly medians*, Distance *386.0* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *535* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	447.1	14.0
gain [dBi], main beam		
height [m], above site surface		13.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	51°20'N	52°08'50"N
longitude	7°02'E	1°36'15"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.138

Figure 210. Path 12099, parameters.

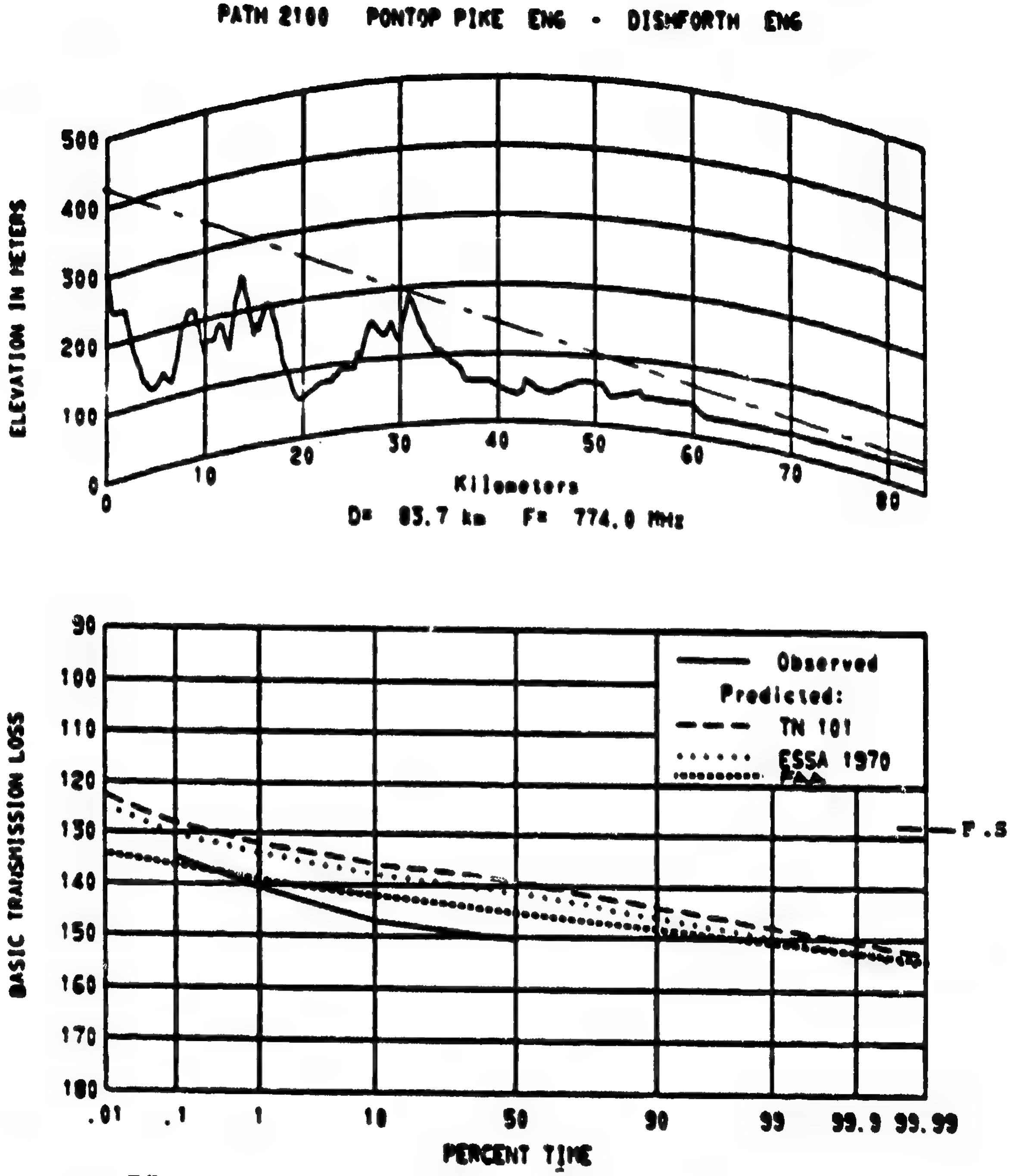


Figure 211. Path 12100, profile and predictions.

Path Number: _ _ _ 1 2 1 0 0

Code Number: 1 1 2 7 1 0 0 4 5 2 1 1 3 1 1 1

Location: *Pontop Pike, England - Dishforth, England*

Data type *6695 hourly medians*, Distance *83.7* km, h_{rs} *33.8* m-msl

N_s *312* N-units, a *8676* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *774* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *100.4* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	427.3	46.0
gain [dBi], main beam		
height [m], above site surface		12.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		52.6
elevation [m-msl]		183.
elevation angle [deg]		
Location, latitude	54°52'08"N	54°08'43"N
longitude	1°46'11"W	1°25'25"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.20

Figure 212. Path 12100, parameters.

PATH 2107 HENDLESHAM ENG - PETERBOROUGH ENG

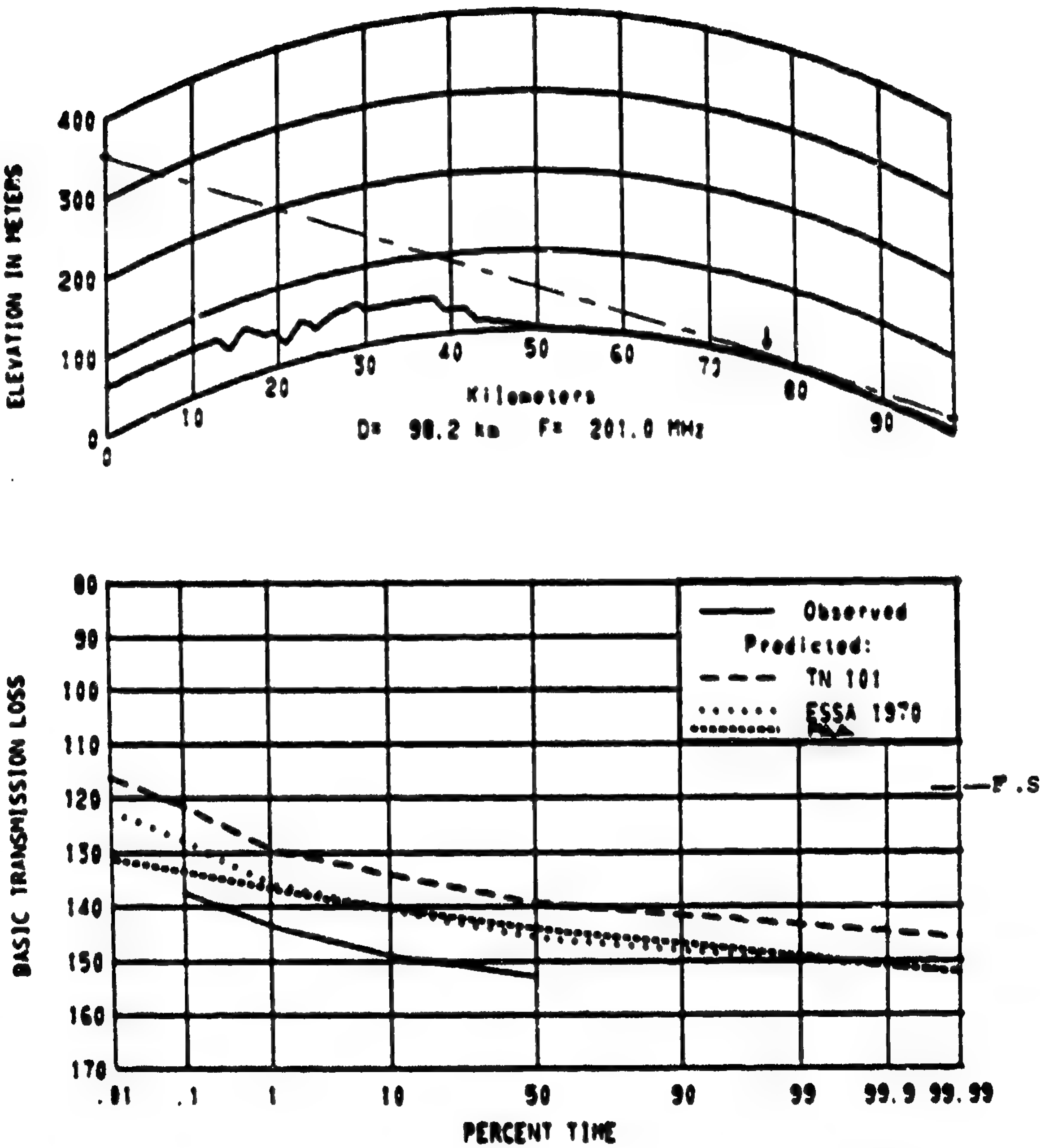


Figure 213. Path 12107, profile and predictions.

Path Number: _ _ _ 1 2 1 0 7

Code Number: 1 1 2 2 2 3 0 4 5 2 1 1 3 1 1 1

Location: *Mendlesham, England - Peterborough, England*

Data type *1 year of hourly medians*, Distance *98.2* km, h_{rs} *7.9* m-msl

N_s *320* N-units, a *8822* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *201* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *32.9* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl].	353.9	20.1
gain [dBi], main beam		
height [m], above site surface		12.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		21.55
elevation [m-msl]		7.6
elevation angle [deg]		
Location, latitude	52°14'03"N	52°34'17"N
longitude	1°06'32"E	0°13'21"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.35

Figure 214. Path 12107, parameters.

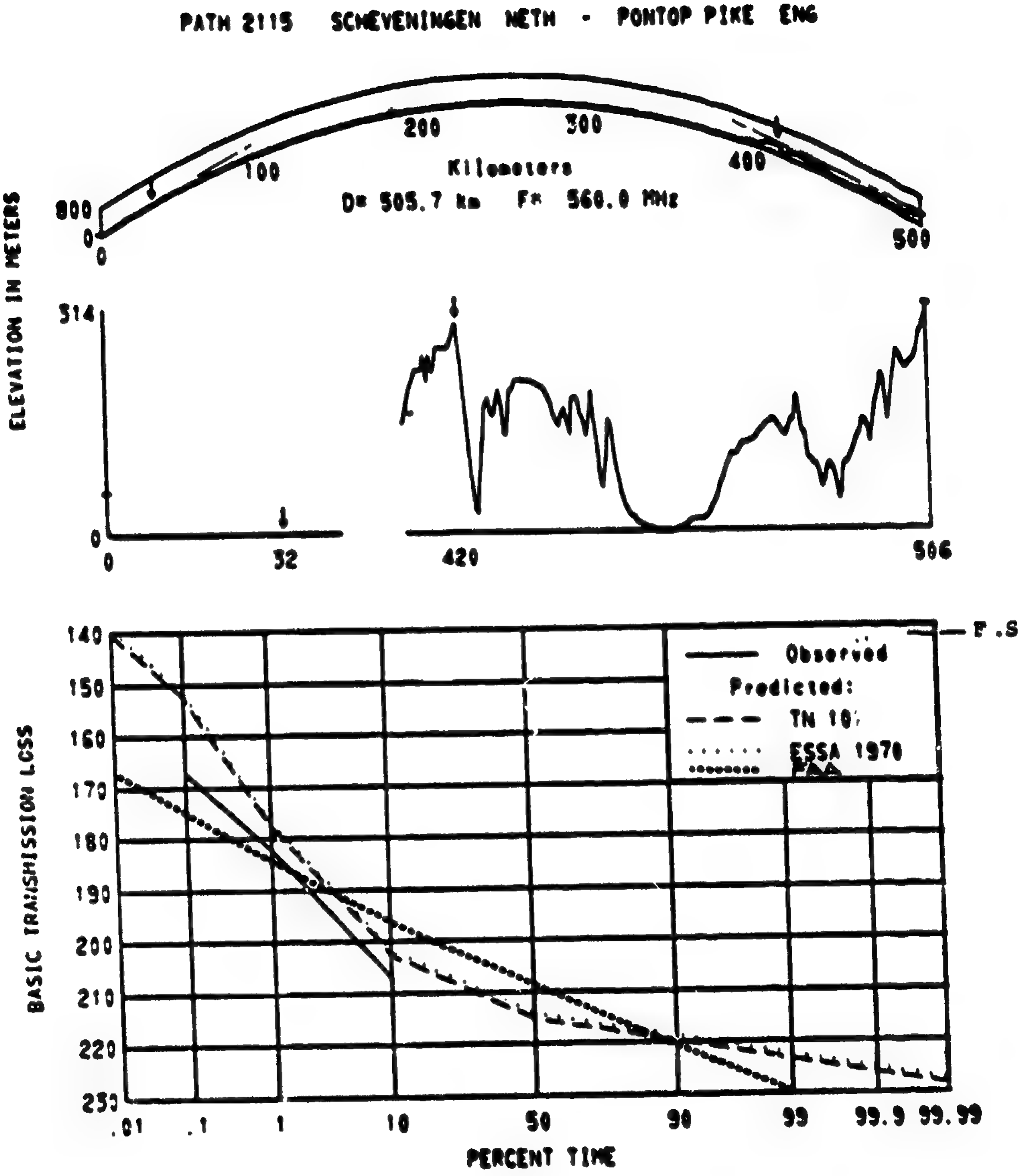


Figure 215. Path 12115, profile and predictions.

Path Number: _ _ _ 1 2 1 1 5

Code Number: 1 1 2 5 3 0 0 4 5 3 1 *1 3 4 1 1

Location: Scheveningen, Netherlands - Pontop Pike, England

Data type 13 months of hourly medians, Distance 505.7 km, h_{rs} 0 m-msl

N_s 312 N-units, a 8676 km, Surface type sea water

Climate maritime temperate oversea, de ____ km

Frequency 560 MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh 0 m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	59.1	313.9
gain [dBi], main beam		
height [m], above site surface	45.7	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°06'N	54°52'08"N
longitude	4°16'E	1°46'11"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.152

Figure 216. Path 12115, parameters.

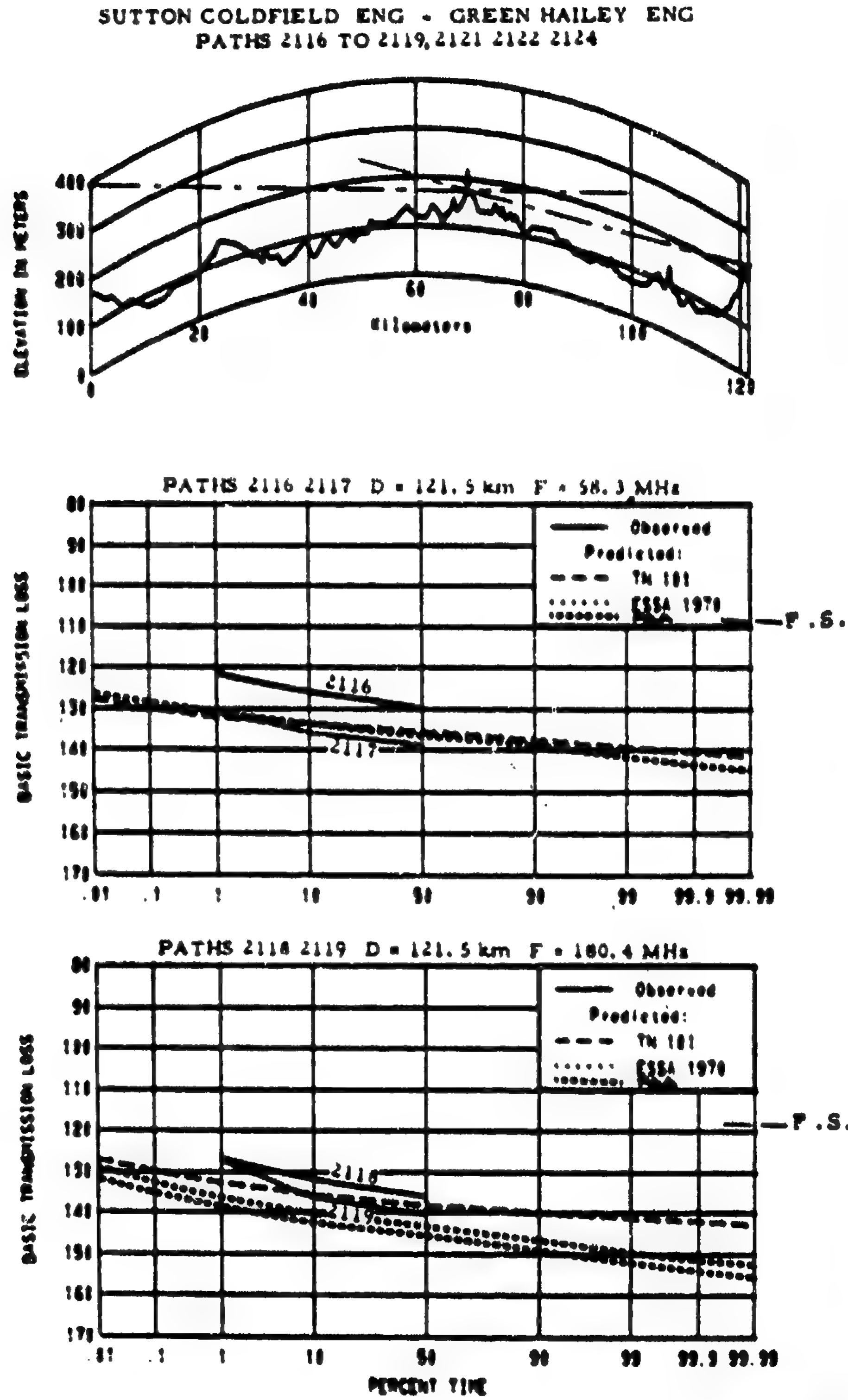


Figure 217. Paths 12116 through 12119, profile and predictions.

Path Number: _ _ _ 1 2 1 1 6

Code Number: 1 1 2 0 2 2 0 4 5 2 1 1 3 1 1 1

Location: Sutton Coldfield, England - Green Hailey, England

Data type 640 hourly medians, Distance 121.5 km, h_{rs} 100 m-msl

N_s 315 N-units, a 8729 km, Surface type average ground

Climate maritime temperate overland, de ______ km

Frequency 58.2 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 72 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	394.1	249.9
gain [dBi], main beam		
height [m], above site surface		22.8
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.95
elevation [m-msl]		175.5
elevation angle [deg]		
Location, latitude	52°35'59"N	51°43'10"N
longitude	1°49'57"W	0°47'06"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.9

Figure 218. Path 12116, parameters.

Path Number: _ _ _ 1 2 1 1 7

Code Number: 1 1 2 0 2 2 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Green Hailey, England*

Data type *6373 hourly medians*, Distance *121.5* km, h_{rs} *100* m-msl

N_s *315* N-units, a *8729* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *58.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *72* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	394.1	230.1
gain [dBi], main beam		
height [m], above site surface		3
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.95
elevation [m-msl]		175.3
elevation angle [deg]		
Location, latitude	52°35'59"N	51°43'10"N
longitude	1°49'57"W	0°47'06"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.9

Figure 219. Path 12117, parameters.

Path Number: _ _ _ 1 2 1 1 8

Code Number: 1 1 2 1 2 2 0 4 5 2 1 1 3 1 1 1

Location: Sutton Coldfield, England - Green Hailey, England

Data type 3274 hourly medians, Distance 121.5 km, h_{rs} 100 m-msl

N_s 315 N-units, a 8729 km, Surface type average ground

Climate maritime temperate overland, de ____ km

Frequency 180.4 MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh 72 m, θ ____ mr

	Transmitter	Receiver
Antenna elevation [m-msl]	380.1	230.1
gain [dBi], main beam		
height [m], above site surface		3
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.95
elevation [m-msl]		175.3
elevation angle [deg]		
Location, latitude	52°35'59"N	51°43'10"N
longitude	1°49'57"W	0°47'06"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.9

Figure 220. Path 12118, parameters.

Path Number: _ _ _ 1 2 1 1 9

Code Number: 1 1 2 1 2 2 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Green Hailey, England*

Data type *3117 hourly medians*, Distance *121.5* km, h_{rs} *100* m-msl

N_s *315* N-units, a *8729* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *180.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *72* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	350.2	230.1
gain [dBi], main beam		
height [m], above site surface		3
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.95
elevation [m-msl]		175.3
elevation angle [deg]		
Location, latitude	52°35'59"N	51°43'10"N
longitude	1°49'57"W	0°47'06"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.9

Figure 221. Path 12119, parameters.

SUTTON COLDFIELD ENG - GREEN HAILEY ENG

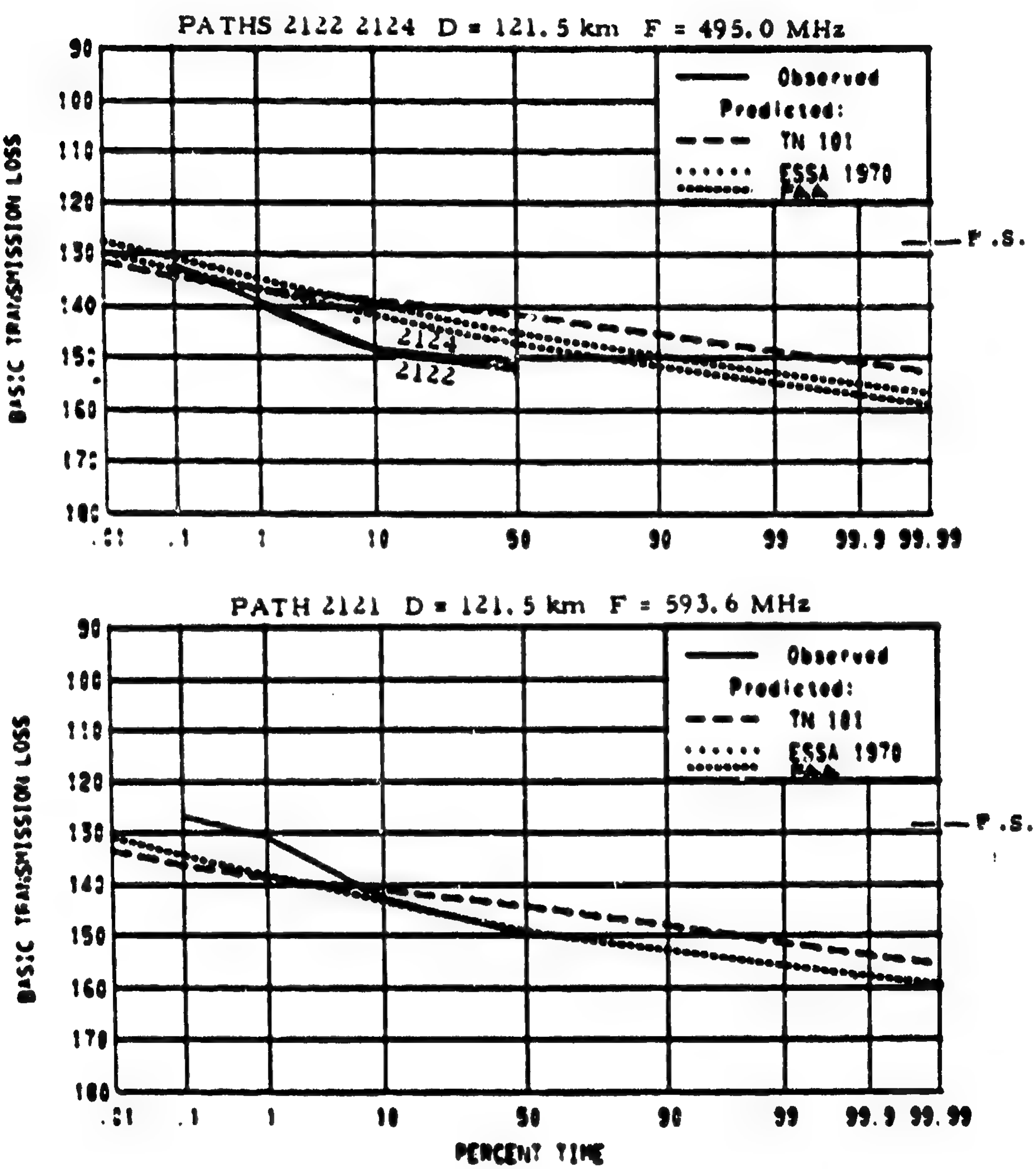


Figure 222. Paths 12122, 12124, and 12121, predictions. (see Figure 217 for profile)

Path Number: _ _ _ 1 2 1 2 2

Code Number: 1 1 2 4 2 2 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Green Hailey, England*

Data type *2868 hourly medians*, Distance *121.5* km, h_{rs} *100* m-msl

N_s *315* N-units, a *8729* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *495* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *72* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	350.2	232.
gain [dBi], main beam		
height [m], above site surface		4.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.95
elevation [m-msl]		175.3
elevation angle [deg]		
Location, latitude	52°35'59"N	51°43'10"N
longitude	1°49'57"W	0°47'06"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.10

Figure 223. Path 12122, parameters.

Path Number: _ _ _ 1 2 1 2 4

Code Number: 1 1 2 4 2 2 0 4 5 2 1 1 3 1 1 1

Location: Sutton Coldfield, England - Green Hailey, England

Data type 1534 hourly medians, Distance 121.5 km, h_{rs} 100 m-msl

N_s 315 N-units, a 8729 km, Surface type average ground

Climate maritime temperate overland, de ______ km

Frequency 495 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 72 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	380.1	232.0
gain [dBi], main beam		
height [m], above site surface		4.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.95
elevation [m-msl]		175.3
elevation angle [deg]		
Location, latitude	52°35'59"N	51°43'10"N
longitude	1°49'57"W	0°47'06"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.10

Figure 224. Path 12124, parameters.

Path Number: _ _ _ 1 2 1 2 1

Code Number: 1 1 2 5 2 2 0 4 5 2 1 1 3 1 1 1

Location: *Sutton Coldfield, England - Green Hailey, England*

Data type *511 hourly medians*, Distance *121.5* km, h_{rs} *100* m-msl

N_s *315* N-units, a *8729* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *593.6* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *72* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	350.2	249.9
gain [dBi], main beam		
height [m], above site surface		22.8
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.95
elevation [m-msl]		175.3
elevation angle [deg]		
Location, latitude	52°35'59"N	51°43'10"N
longitude	1°49'57"W	0°47'06"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.10

Figure 225. Path 12121, parameters.

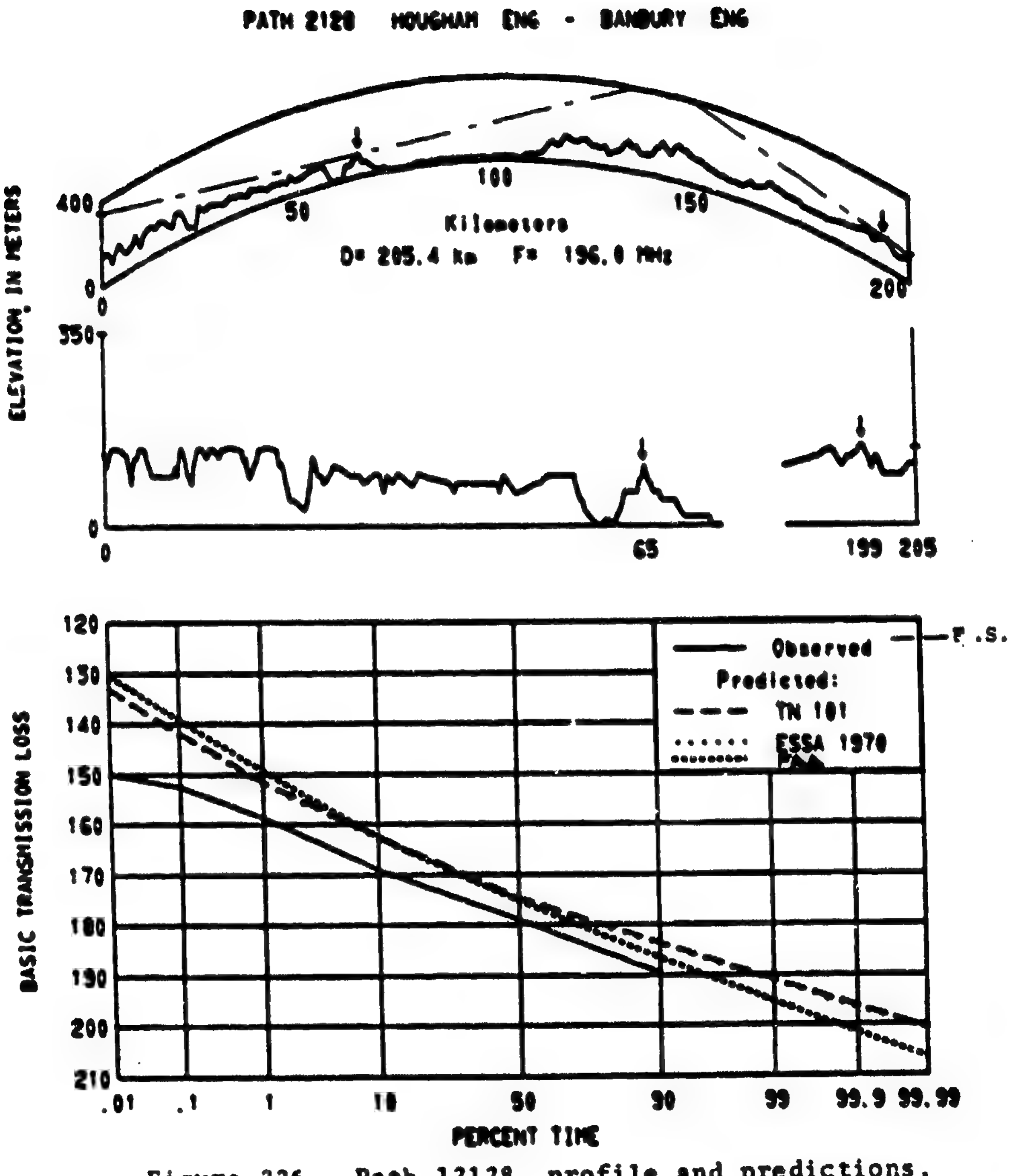


Figure 226. Path 12128, profile and predictions.

Path Number: _ _ _ 1 2 1 2 8

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Hougham, England - Banbury, England*

Data type *2100 hourly medians*, Distance *205.4* km, h_{rs} *106.7* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *196* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *127.2* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	349.9	139.9
gain [dBi], main beam		
height [m], above site surface		29.5
line loss [dB]		
polarization	V	V
type		
Horizon distance [km]		6.44
elevation [m-msl]		144.8
elevation angle [deg]		
Location, latitude	51°06'40"N	52°02'05"N
longitude	1°14'58"E	1°18'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.94

Figure 227. Path 12128, parameters.

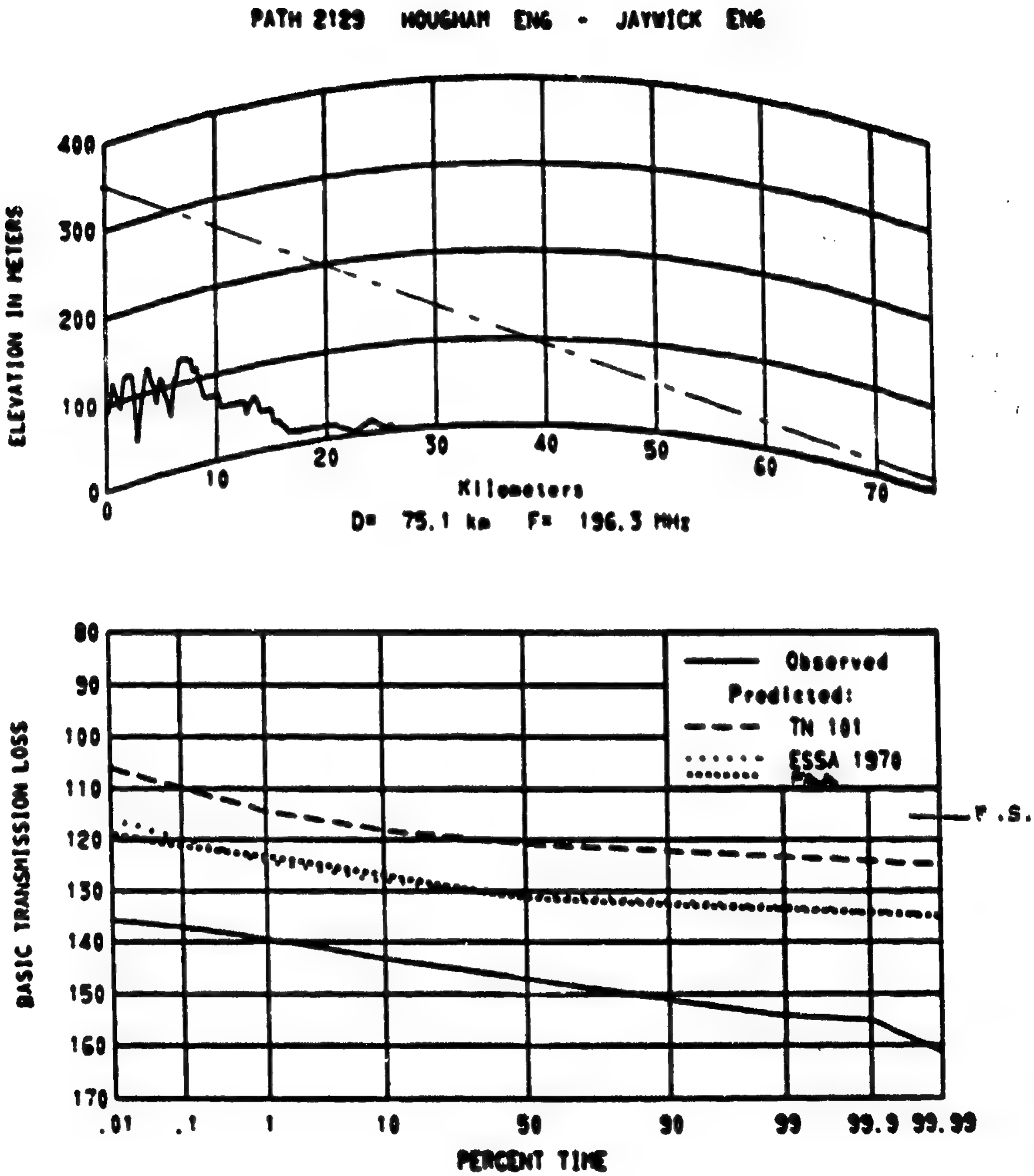


Figure 228. Path 12129, profile and predictions.

Path Number: _ _ _ 1 2 1 2 9

Code Number: 1 1 2 1 1 0 0 4 5 1 1 1 3 1 1 1

Location: *Hougham, England - Jaywick, England*

Data type *2100 hourly medians*, Distance 75.1 km, h_{rs} 0 m-msl

N_s 315 N-units, a 8729 km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency 196.2 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 0 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	349.9	14.9
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	51°06'40"N	51°46'50"N
longitude	1°14'58"E	1°07'20"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.19

Figure 229. Path 12129, parameters.

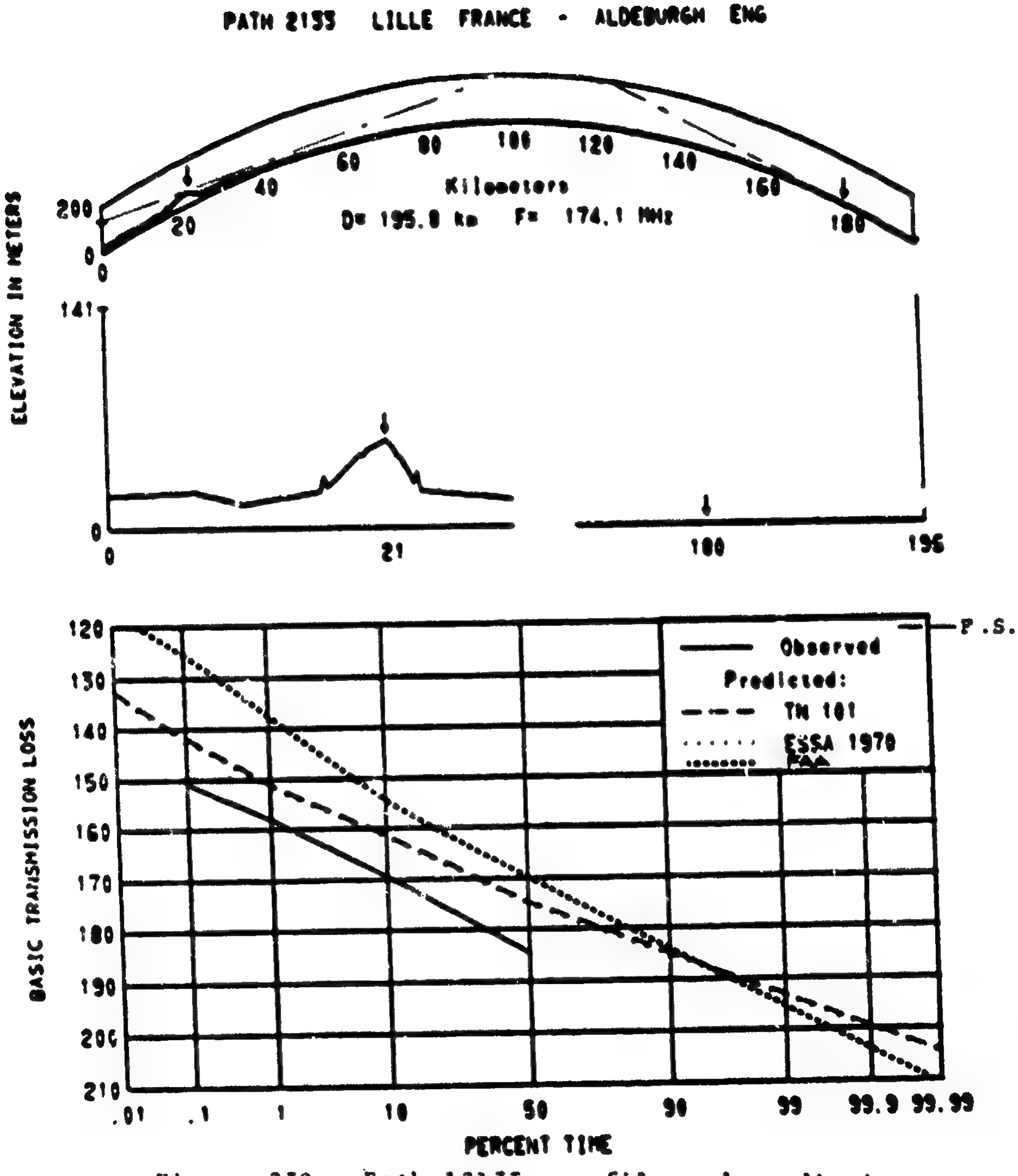


Figure 230. Path 12133, profile and predictions.

Path Number: _ _ _ 1 2 1 3 3

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Lille, France - Aldeburgh, England*

Data type *8 months of hourly medians*, Distance 195.8 km, h_{rs} 0 m-msl

N_s 320 N-units, a 8822 km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency 174.1 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 0 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	141.1	14.9
gain [dBi], main beam		
height [m], above site surface		14.6
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	50°38'30"N	52°08'50"N
longitude	3°03'30"E	1°36'15"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TR[illegible] 16, fig. 3.133

Figure 231. Path 12133, parameters.

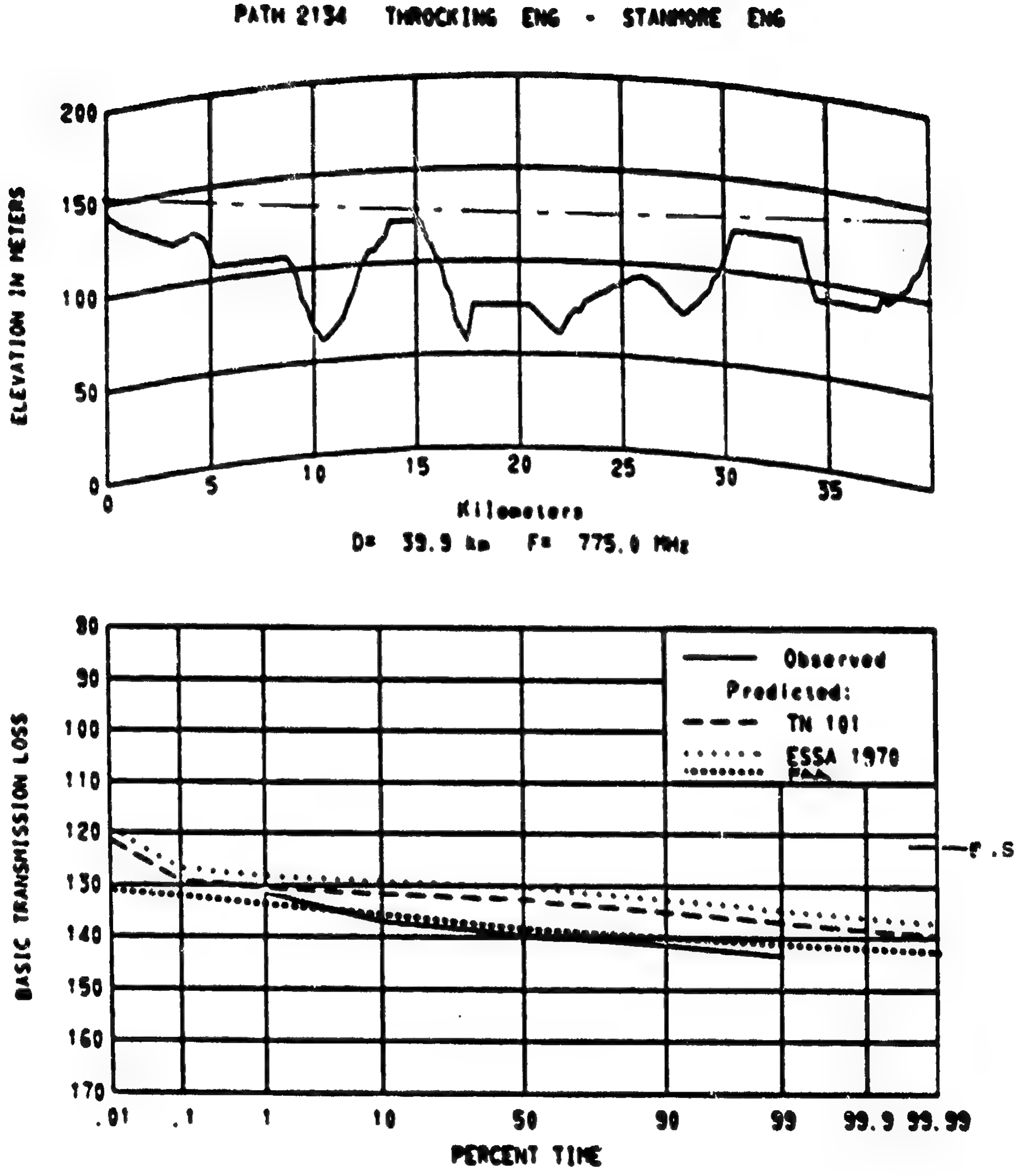


Figure 232. Path 12134, profile and predictions.

Path Number: _ _ _ 1 2 1 3 4

Code Number: 1 1 2 7 1 0 0 4 5 2 1 1 3 1 1 1

Location: *Throcking, England - Stanmore, England*

Data type *9926 hourly medians*, Distance 39.9 km, h_{rs} 120 m-msl

N_s 316 N-units, a 8747 km, Surface type *average ground*

Climate *maritime temperate overland*, de ________ km

Frequency 775 MHz, Transmitter output ________ dBW, EIRP ________ dBW

Δh 87.8 m, θ ________ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	153	143.9
gain [dBi], main beam		
height [m], above site surface		12.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		24.8
elevation [m-msl]		122.
elevation angle [deg]		
Location, latitude	51°57'03"N	51°37'51"N
longitude	0°03'34"W	0°19'15"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.17

Figure 233. Path 12134, parameters.

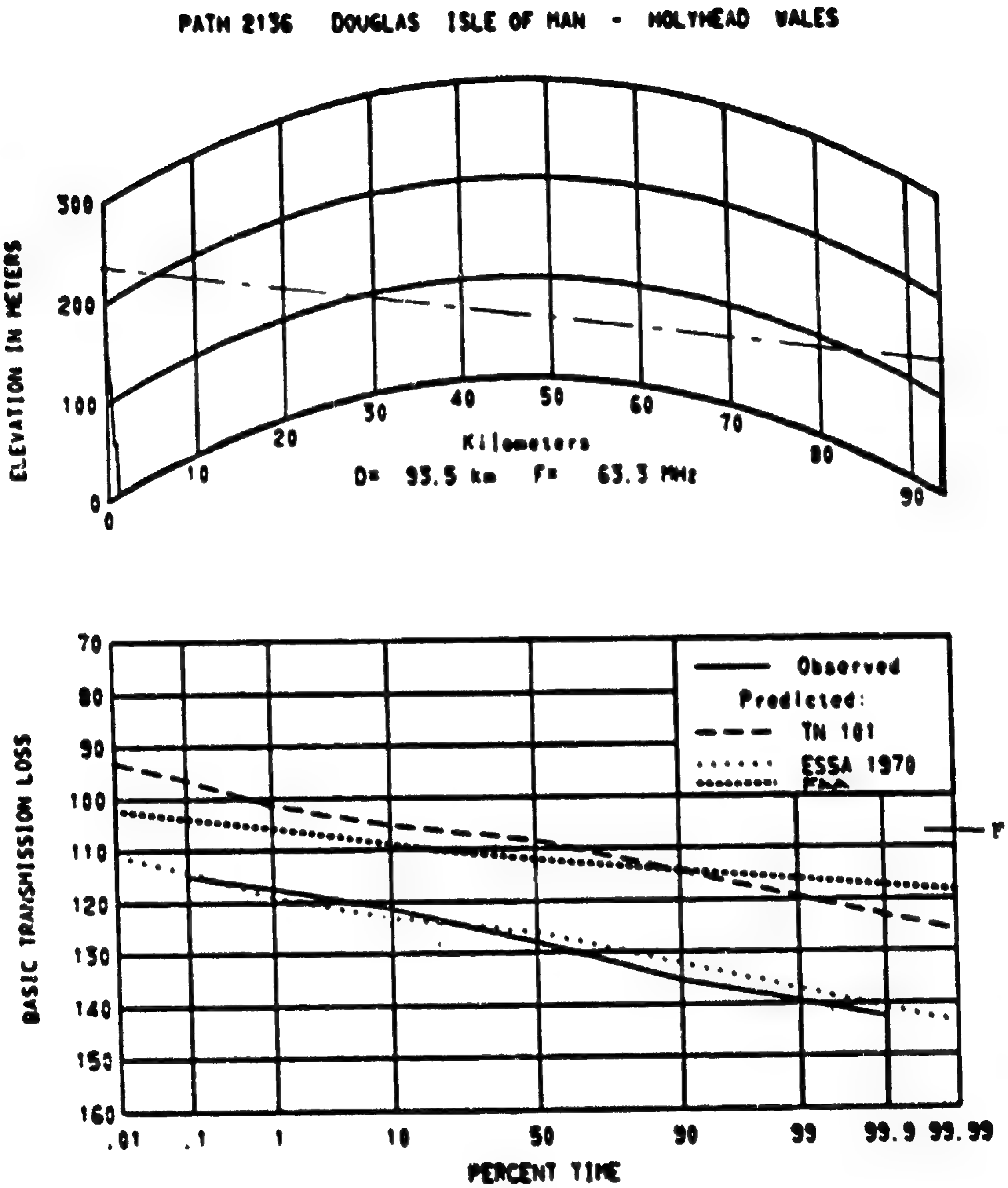


Figure 234. Path 12136, profile and predictions.

Path Number: _ _ _ 1 2 1 3 6

Code Number: 1 1 2 0 1 0 0 4 5 3 1 1 3 1 1 1

Location: *Douglas, Isle of Man - Holyhead, Wales*

Data type *3000 hourly medians*, Distance 93.5 km, h_{rs} 0 m-msl

N_s 319 N-units, a 8803 km, Surface type *sea water*

Climate *maritime temperate oversea*, de ____ km

Frequency 63.2 MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh 0 m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	235	137.2
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	V	V
type		
Horizon distance [km]		93.5
elevation [m-msl]		150
elevation angle [deg]		
Location, latitude	54°08'25"N	53°18'33"N
longitude	4°29'32"W	4°41'13"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.21

Figure 235. Path 12136, parameters.

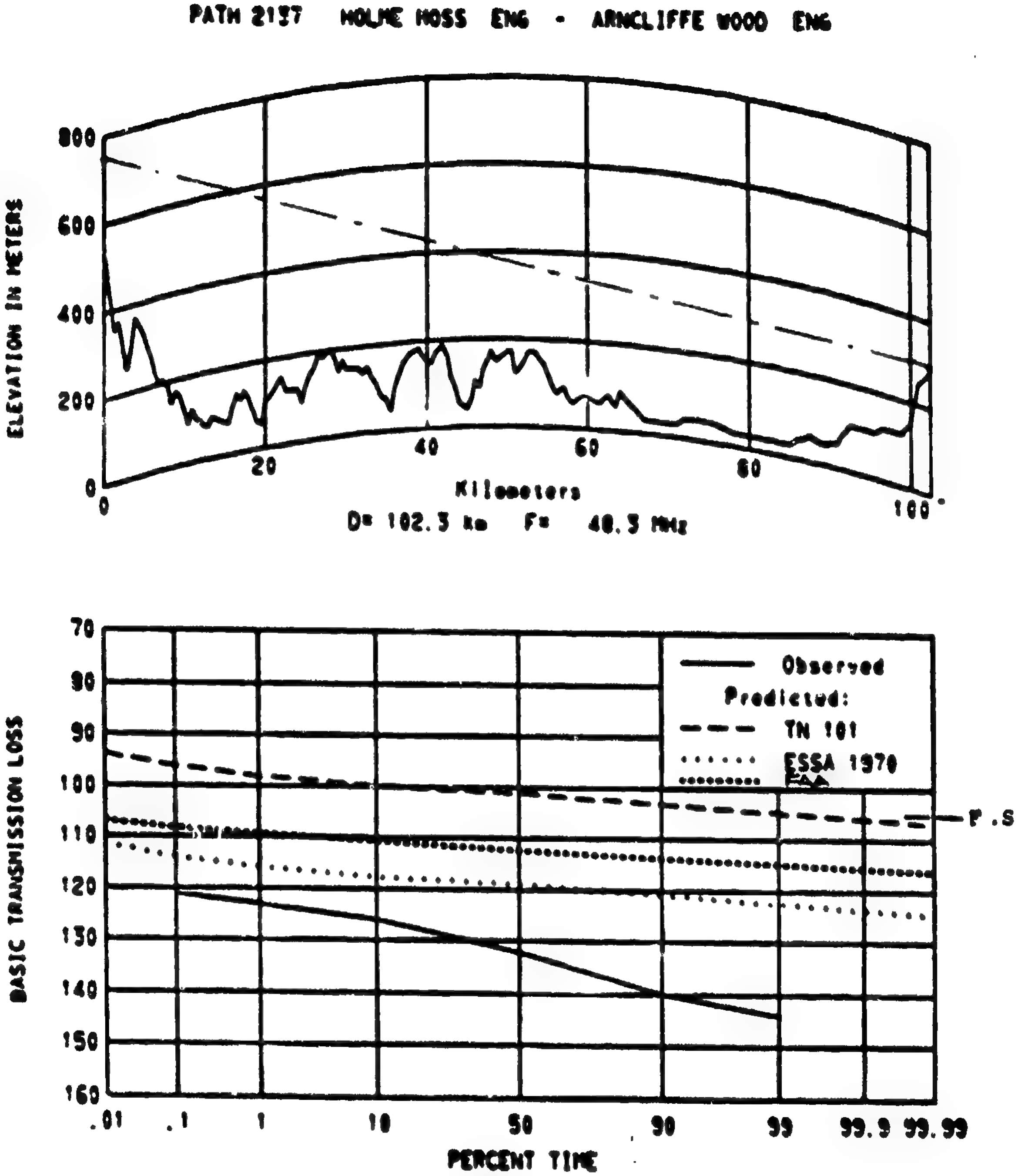


Figure 236. Path 12137, profile and predictions.

Path Number: _ _ _ 1 2 1 3 7

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 3 1 1 1

Location: Holme Moss, England - Arncliffe Wood, England

Data type 2100 hourly medians, Distance 102.3 km, h_{rs} 190 m-msl

N_s 303 N-units, a 8525 km, Surface type average ground

Climate maritime temperate overland, de ______ km

Frequency 48.2 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 153 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	740.9	296
gain [dBi], main beam		
height [m], above site surface		6.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		102.3
elevation [m-msl]		524.3
elevation angle [deg]		
Location, latitude	53°31'58"N	54°23'20"N
longitude	1°51'22"W	1°17'30"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.22

Figure 237. Path 12137, parameters.

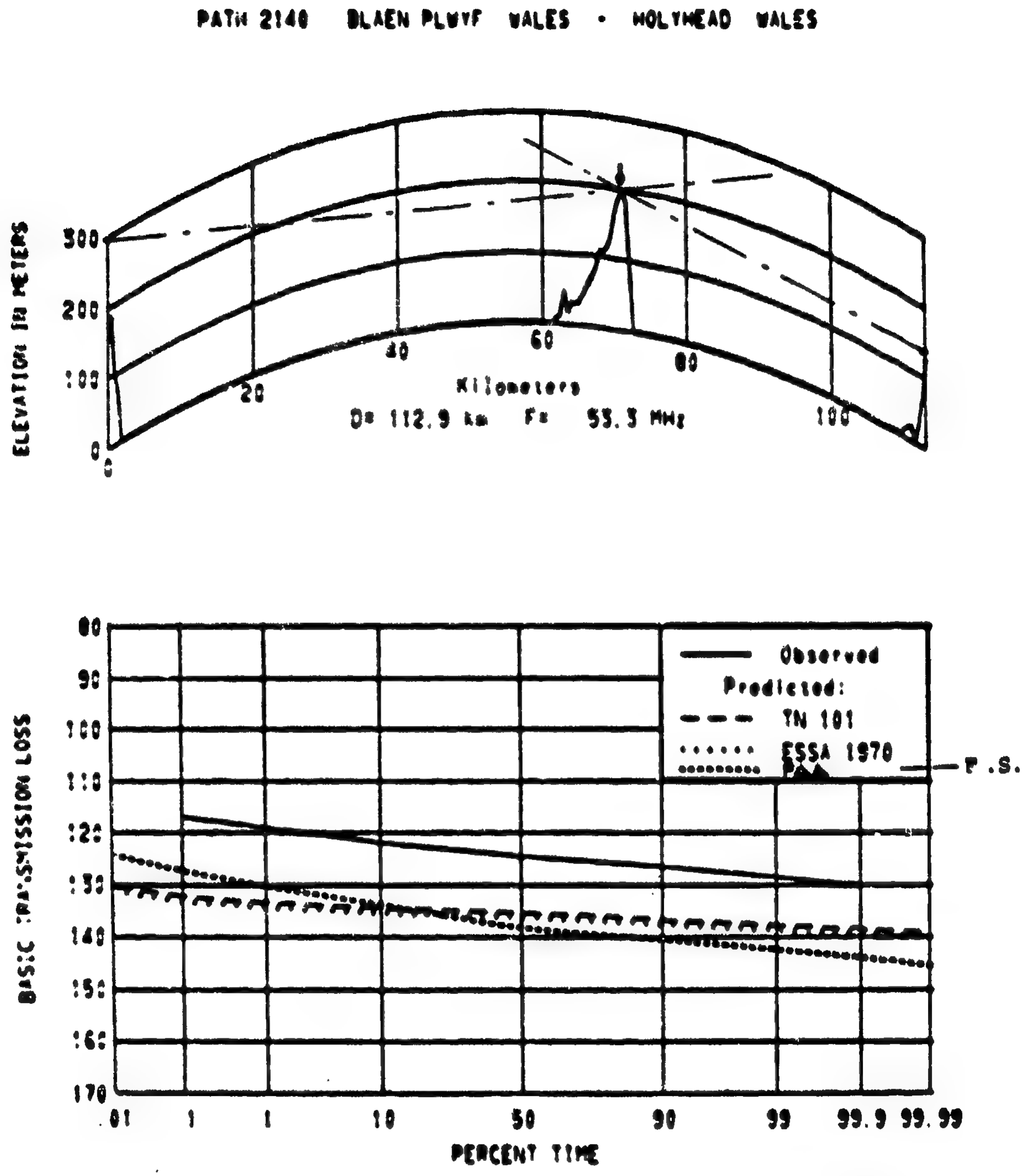


Figure 238. Path 12140, profile and predictions.

Path Number: _ _ _ 1 2 1 4 0

Code Number: 1 1 2 0 2 1 0 4 5 3 1 1 3 1 1 1

Location: Blaen Plwyf, Wales - Holyhead, Wales

Data type 3000 hourly medians, Distance 112.9 km, h_{rs} 0 m-msl

N_s 316 N-units, a 8747 km, Surface type sea water

Climate maritime temperate oversea, de ______ km

Frequency 53.2 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 0 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	298.1	137.2
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		42.04
elevation [m-msl]		198.1
elevation angle [deg]		
Location, latitude	52°21'36"N	53°18'33"N
longitude	4°06'00"W	4°41'13"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.8

Figure 239. Path 12140, parameters.

PATH 2141 BLAEN PLWYF WALES - DUBLIN IRE

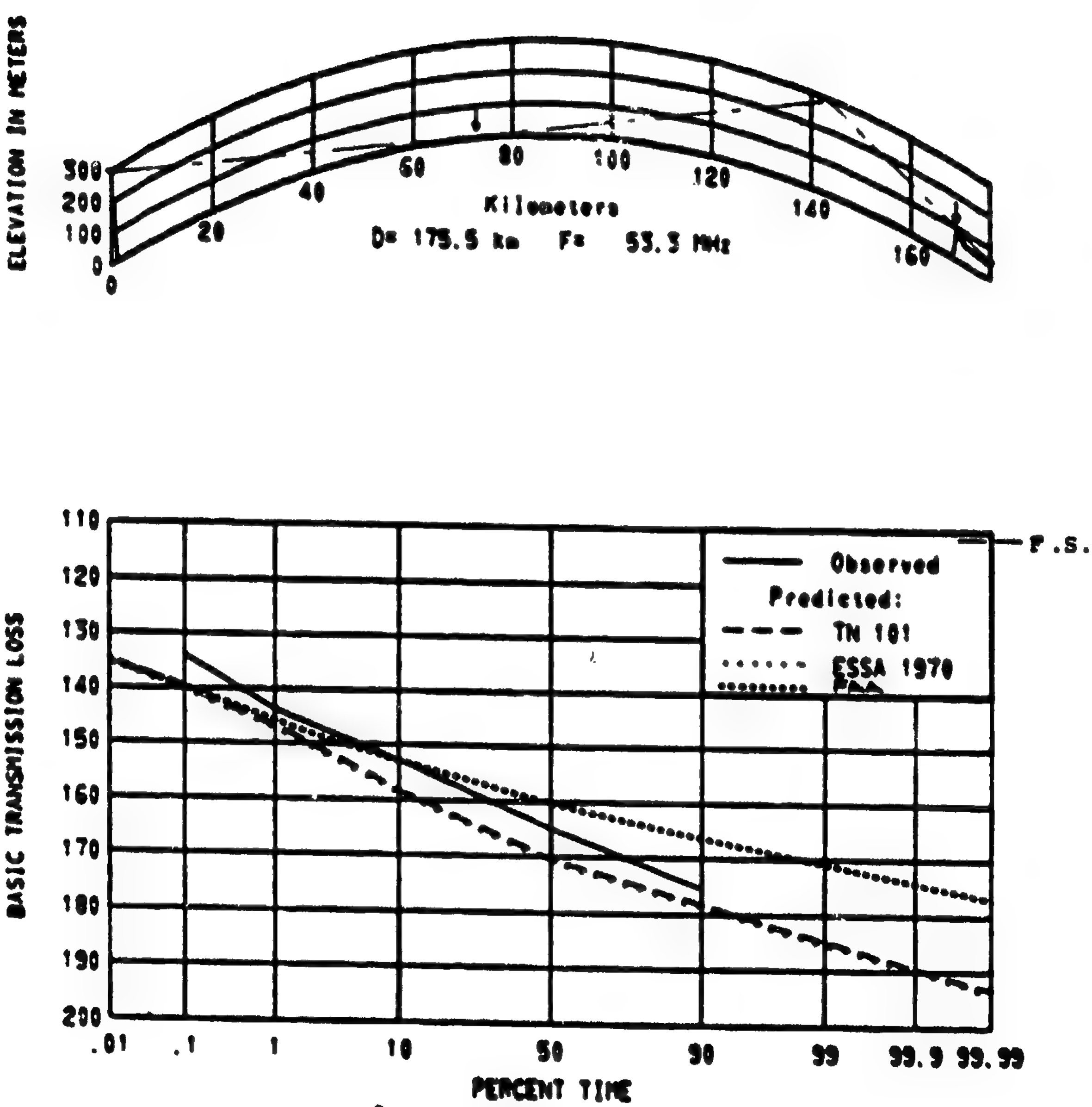


Figure 240. Path 12141, profile and predictions.

Path Number: _ _ _ 1 2 1 4 1

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Blaen Plwyf, Wales - Dublin, Ireland*

Data type *4200 hourly medians*, Distance 175.5 km, h_{rs} 0 m-msl

N_s 321 N-units, a 8841 km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency 53.2 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 6.7 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	298.1	54.9
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		6.44
elevation [m-msl]		91.4
elevation angle [deg]		
Location, latitude	52°21'36"N	53°17'34"N
longitude	4°06'00"W	6°11'49"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.85

Figure 241. Path 12141, parameters.

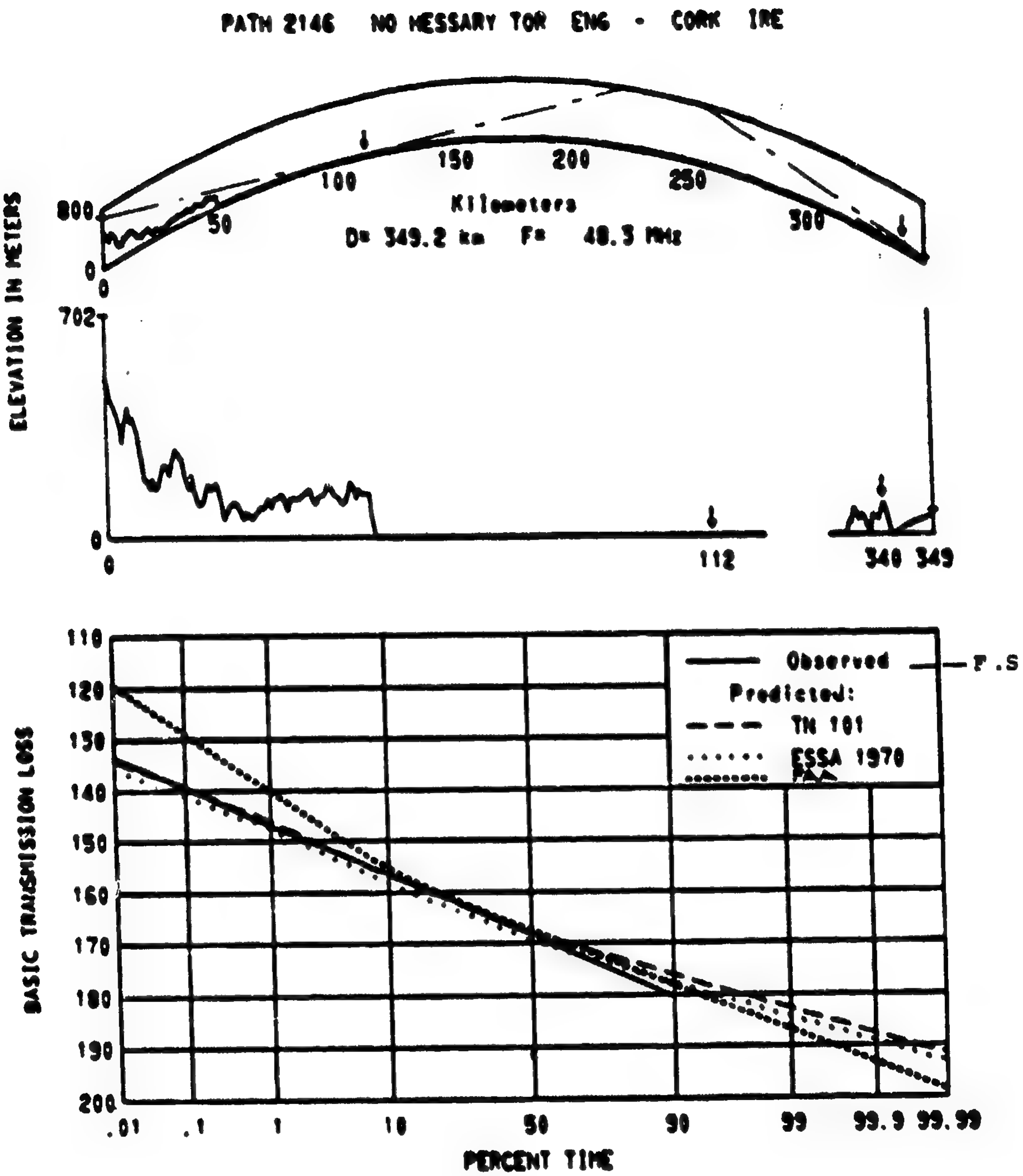


Figure 242. Path 12146, profile and predictions.

Path Number: _ _ _ 1 2 1 4 6

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 3 1 1 1

Location: *No. Hessary Tor, England - Cork, Ireland*

Data type *4200 hourly medians*, Distance *349.2* km, h_{rs} *0* m-msl

N_s *322* N-units, a *8860* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *48.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *130.7* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	702	72.8
gain [dBi], main beam		
height [m], above site surface		12.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		9.17
elevation [m-msl]		97.5
elevation angle [deg]		
Location, latitude	50°32'59"N	51°55'40"N
longitude	4°00'26"W	8°29'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.118

Figure 243. Path 12146, parameters.

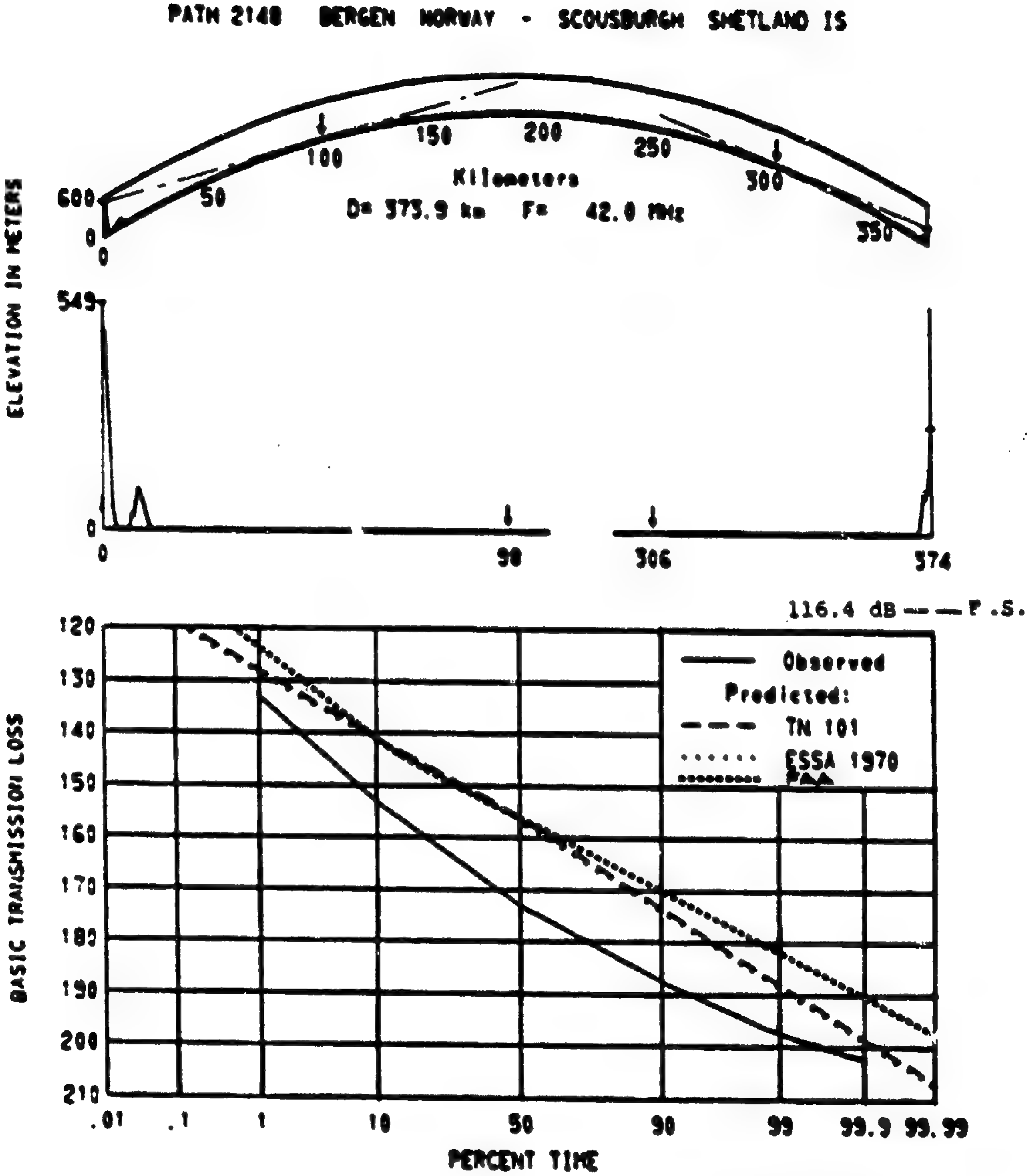


Figure 244. Path 12148, profile and predictions.

Path Number: _ _ _ 1 2 1 4 8

Code Number: 1 1 2 0 3 0 0 4 5 3 1 1 3 5 1 1

Location: *Bergen, Norway - Scousburgh, Shetland Islands*

Data type *16000 hourly medians*, Distance *373.9* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ____ km

Frequency *42* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	548.9	262.1
gain [dBi], main beam		
height [m], above site surface		17.3
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	60°24'42"N	59°57'10"N
longitude	5°21'50"E	1°18'20"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.158

Figure 245. Path 12148, parameters.

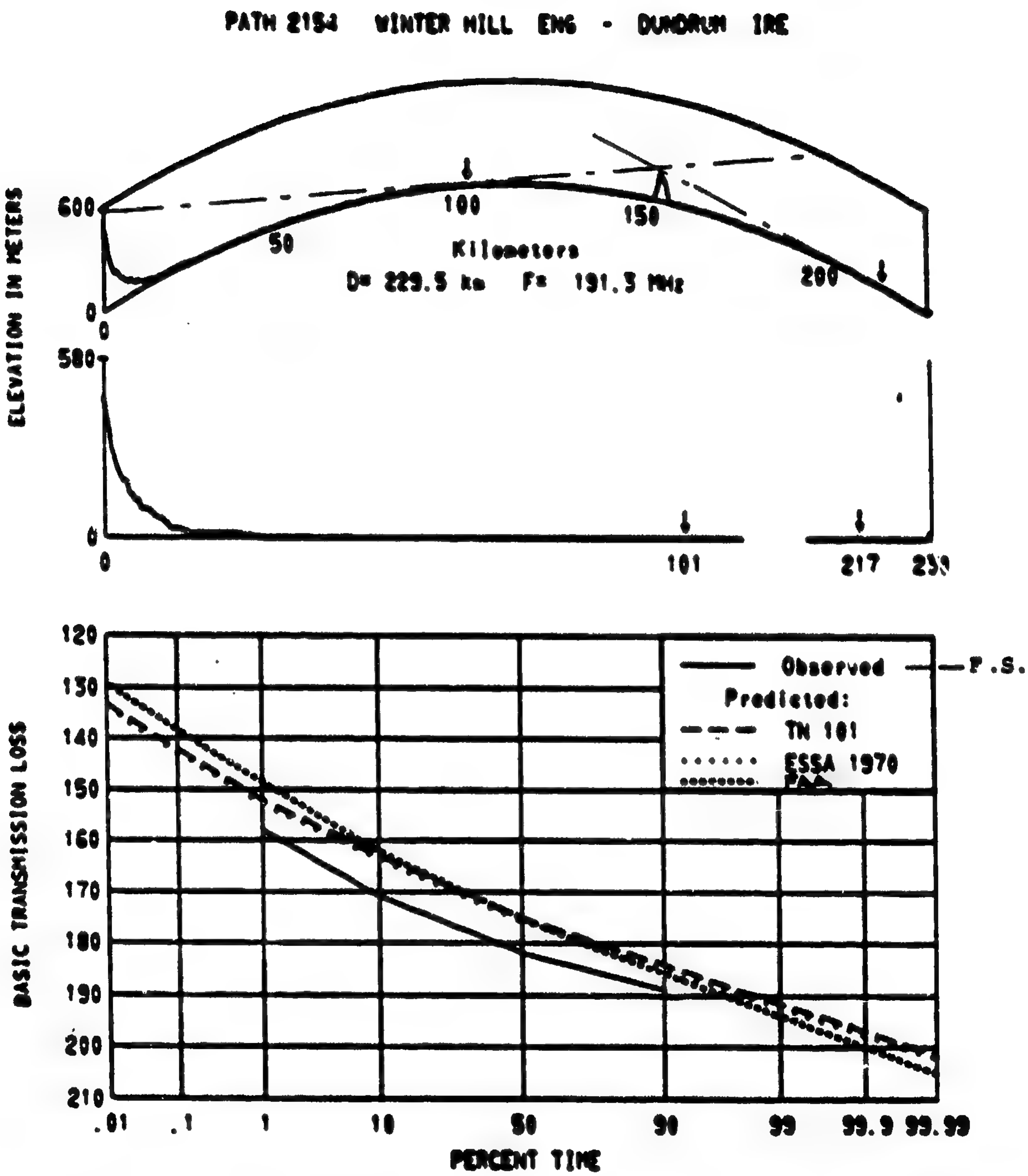


Figure 246. Path 12154, profile and predictions.

Path Number: _ _ _ 1 2 1 5 4

Code Number: 1 1 2 1 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Winter Hill, England - Dundrum, Ireland*

Data type *4200 hourly medians*, Distance *229.5* km, h_{rs} *0* m-msl

N_s *321* N-units, a *8841* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *191.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *36.4* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	580	17
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	V	V
type		
Horizon distance [km]		12.39
elevation [m-msl]		6.1
elevation angle [deg]		
Location, latitude	53°37'44"N	54°15'31"N
longitude	2°30'55"W	5°50'26"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.99

Figure 247. Path 12154, parameters.

PATH 2155 WINTER HILL ENG - NEWTOWNARDS IRE

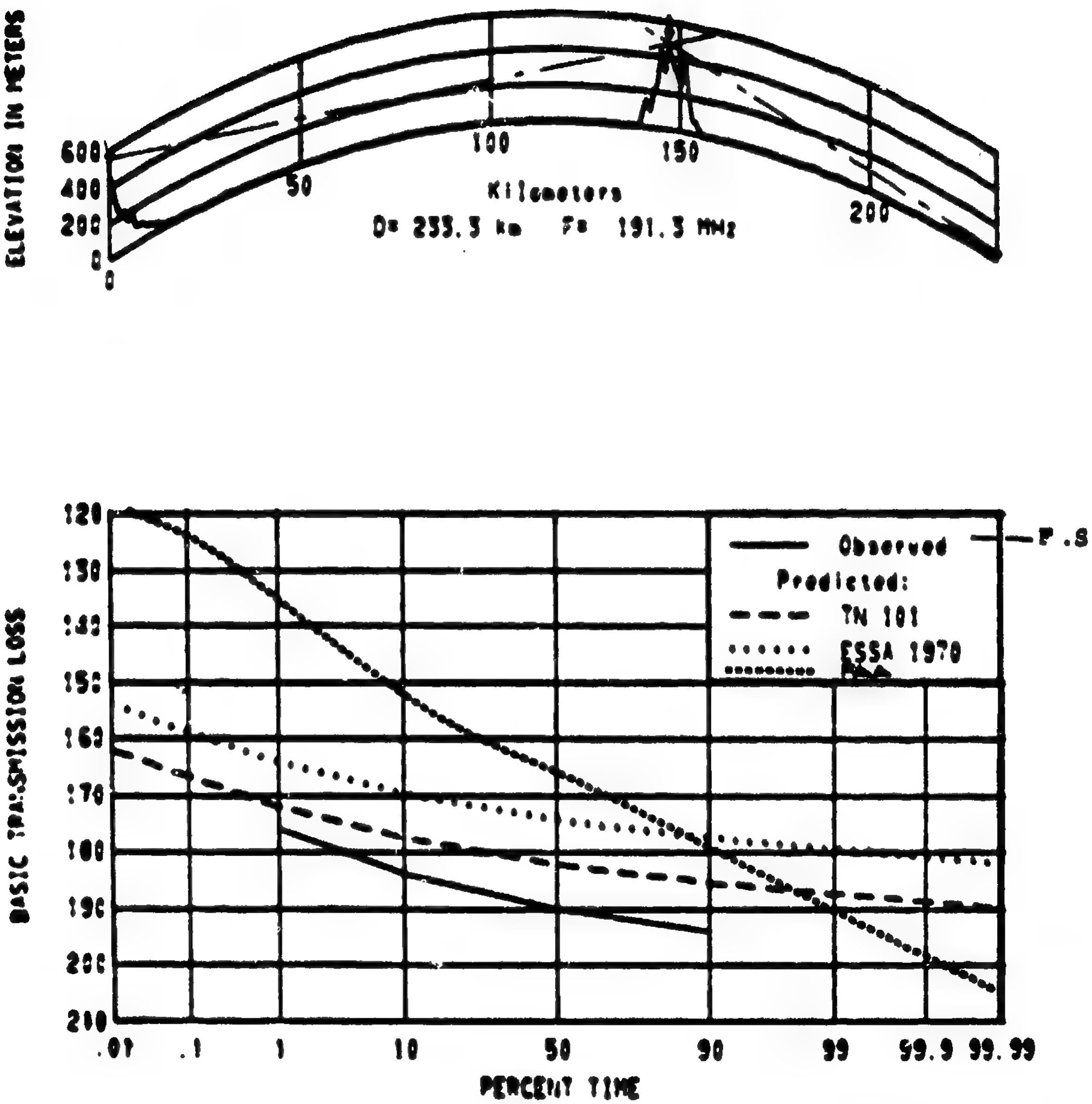


Figure 248. Path 12155, profile and predictions.

Path Number: _ _ _ 1 2 1 5 5

Code Number: 1 1 2 1 2 2 0 4 5 3 1 1 3 1 1 1

Location: *Winter Hill, England - Newtownards, Ireland*

Data type *10 months of hourly medians*, Distance *233.3* km, h_{rs} *0* m-msl

N_s *315* N-units, a *8694* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *191.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	579.1	39.6
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	V	V
type		
Horizon distance [km]		86.21
elevation [m-msl]		472.4
elevation angle [deg]		
Location, latitude	53°37'44"N	54°35'19"N
longitude	2°30'55"W	5°41' W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.12

Figure 249. Path 12155, parameters.

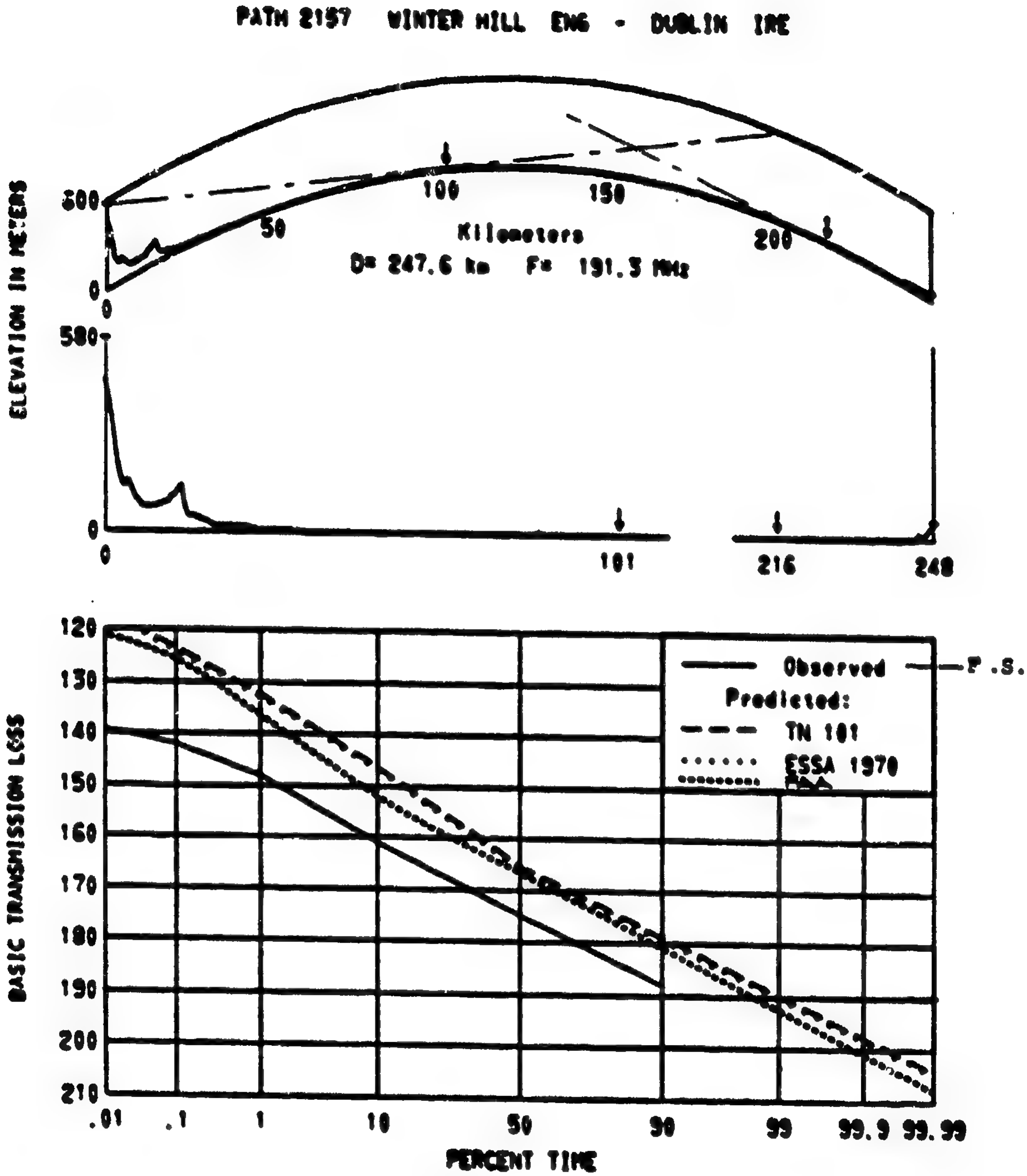


Figure 250. Path 12157, profile and predictions.

Path Number: _ _ _ 1 2 1 5 7

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 3 1 1 1

Location: *Winter Hill, England - Dublin, Ireland*

Data type *4200 hourly medians*, Distance *247.6* km, h_{rs} *0* m-msl

N_s *322* N-units, a *6860* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *191.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

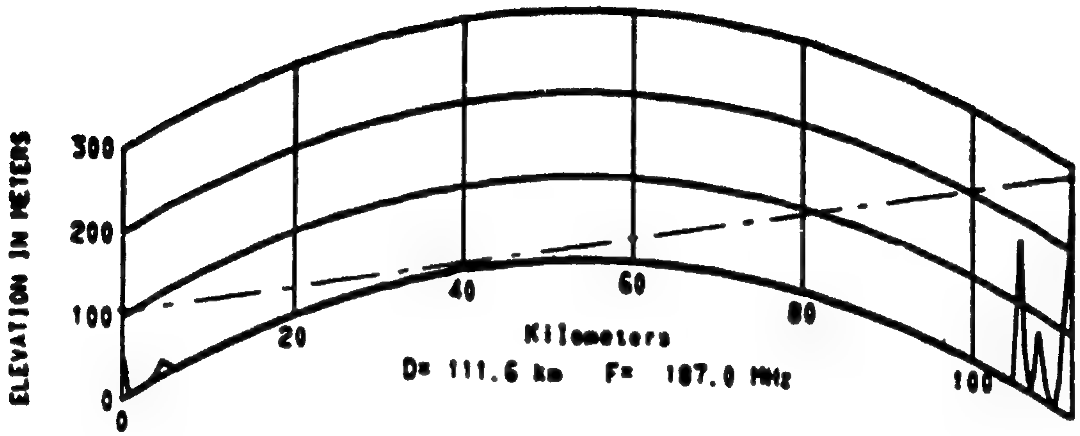
	Transmitter	Receiver
Antenna elevation [m-msl]	580	54.9
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	53°37'44"N	53°17'34"N
longitude	2°30'55"W	6°11'49"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.104

Figure 251. Path 12157, parameters.

SANDAY ORKNEY IS - SCOUSBURGH SHETLAND IS
PATHS 2168 2169



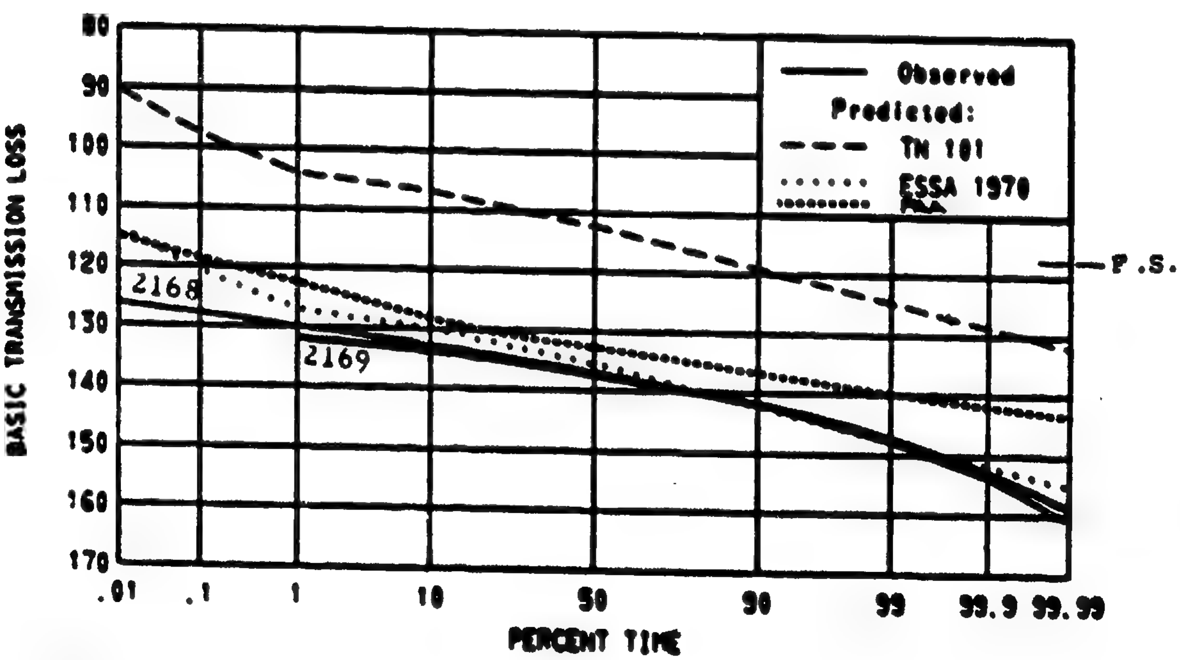


Figure 252. Paths 12168 and 12169, profile and predictions.

Path Number: _ _ _ 1 2 1 6 8

Code Number: 1 1 2 1 1 0 0 4 5 3 1 1 3 5 1 1

Location: *Sanday, Orkney Islands - Scousburgh, Shetland Islands*

Data type *8400 hourly medians*, Distance *111.6* km, h_{rs} *0* m-msl

N_s *315* N-units, a *8729* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *187* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	107.9	285.9
gain [dBi], main beam		
height [m], above site surface	57.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	59°13'16"N	59°57'10"N
longitude	2°39'06"W	1°18'20"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.23

Figure 253. Path 12168, parameters.

Path Number: _ _ _ 1 2 1 6 9

Code Number: 1 1 2 1 1 0 0 4 5 3 1 1 3 5 1 1

Location: *Sanday, Orkney Islands - Scousburgh, Shetland Islands*

Data type *8400 hourly medians*, Distance *111.6* km, h_{rs} *0* m-msl

N_s *315* N-units, a *8729* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *187* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

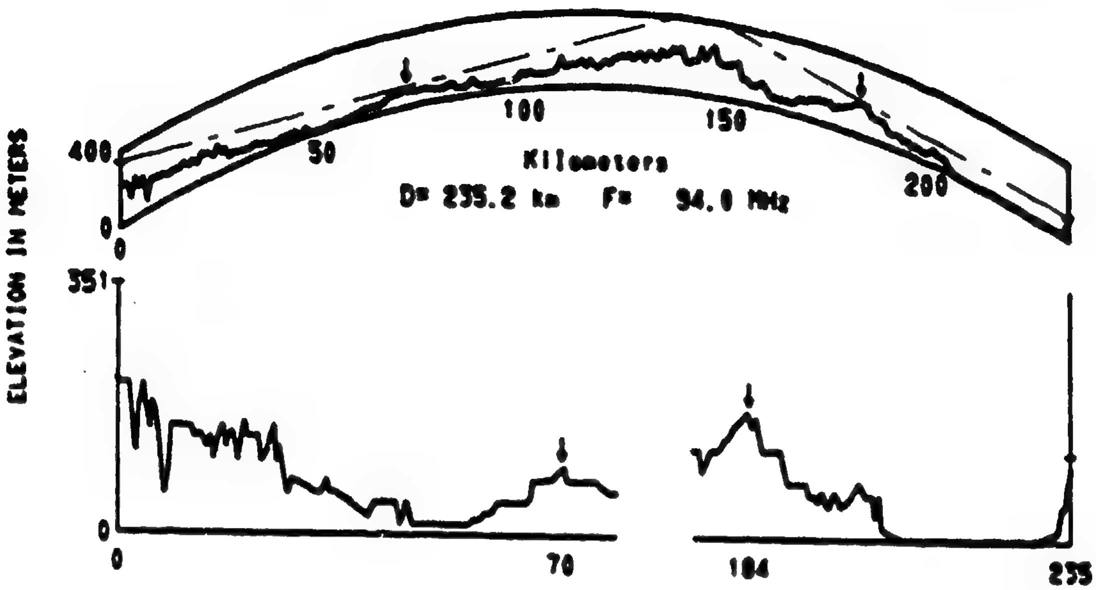
	Transmitter	Receiver
Antenna elevation [m-msl]	107.9	277.1
gain [dBi], main beam		
height [m], above site surface	57.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	59°13'16"N	59°57'10"N
longitude	2°39'06"W	1°18'20"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.23

Figure 254. Path 12169, parameters.

PATHS 2174 2187 WROTHAM ENG - CASTLETON WALES



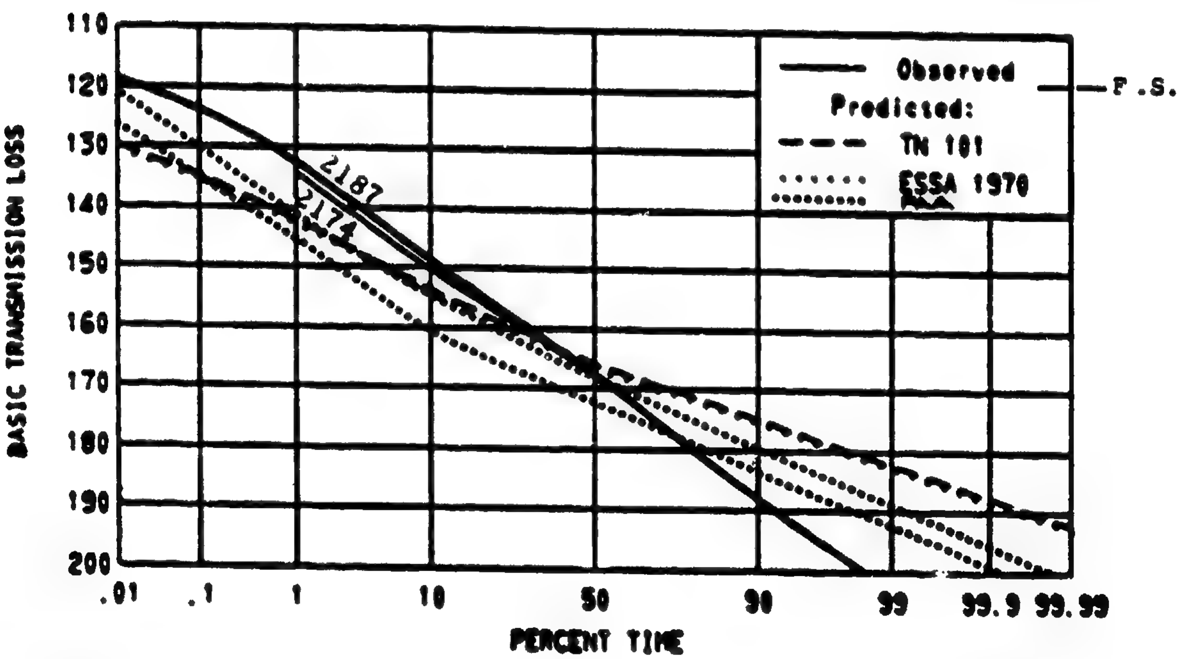


Figure 255. Paths 12174 and 12187, profile and predictions.

Path Number: _ _ _ 1 2 1 7 4

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Wrotham, England - Castleton, Wales*

Data type *4 months of hourly medians*, Distance 235.2 km, h_{rs} 94.5 m-msl

N_s 317 N-units, a 8766 km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency 94. MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 170.4 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	350.5	121.9
gain [dBi], main beam		
height [m], above site surface		16.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.34
elevation [m-msl]		175.3
elevation angle [deg]		
Location, latitude	51°19'11"N	51°33'12"N
longitude	0°17'20"E	3°04'14"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.100

Figure 256. Path 12174, parameters.

Path Number: _ _ _ 1 2 1 8 7

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Wrotham, England - Castleton, Wales*

Data type *1200 hourly medians*, Distance *235.2* km, h_{rs} *94.5* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *93.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *170.4* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	349.9	107
gain [dBi], main beam		
height [m], above site surface		1.8
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		51.34
elevation [m-msl]		175.3
elevation angle [deg]		
Location, latitude	51°19'11"N	51°33'12"N
longitude	0°17'20"E	3°04'14"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.100

Figure 257. Path 12187, parameters.

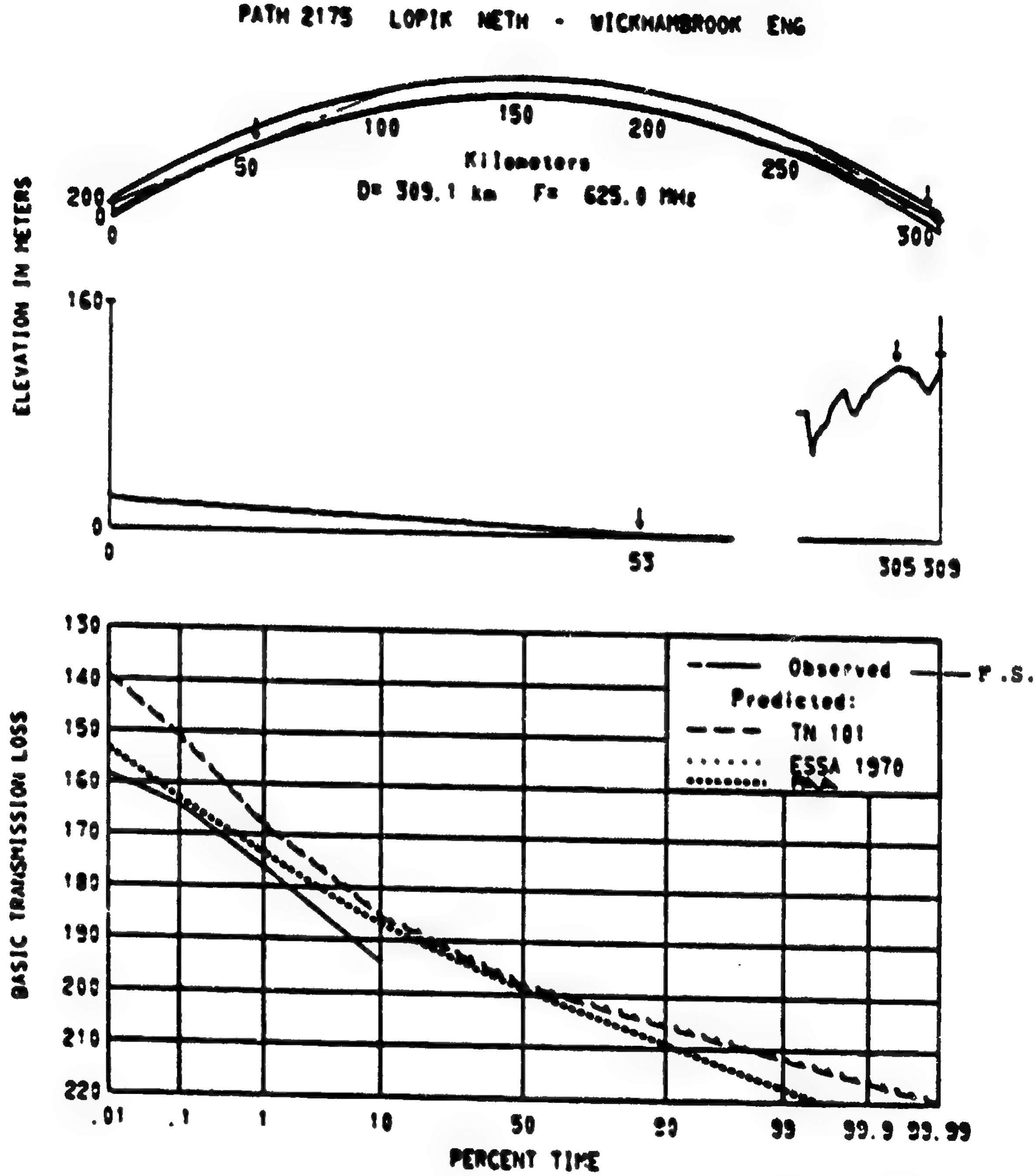


Figure 258. Path 12175, profile and predictions.

Path Number: _ _ _ 1 2 1 7 5

Code Number: 1 1 2 6 3 0 0 4 5 2 1 1 3 4 1 1

Location: *Lopik, Netherlands - Wickhambrook, England*

Data type *6 months of hourly medians*, Distance 309.1 km, h_{rs} 1 m-msl

N_s 316 N-units, a 8747 km, Surface type *average ground*

Climate *maritime temperate overland*, de ____ km

Frequency 625 MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh 53.8 m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	160	134.1
gain [dBi], main beam		
height [m], above site surface		12.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		4.35
elevation [m-msl]		123.4
elevation angle [deg]		
Location, latitude	52°01'N	52°11'25"N
longitude	5°03'E	0°33'01"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, *fig.* 3.143

Figure 259. Path 12175, parameters.

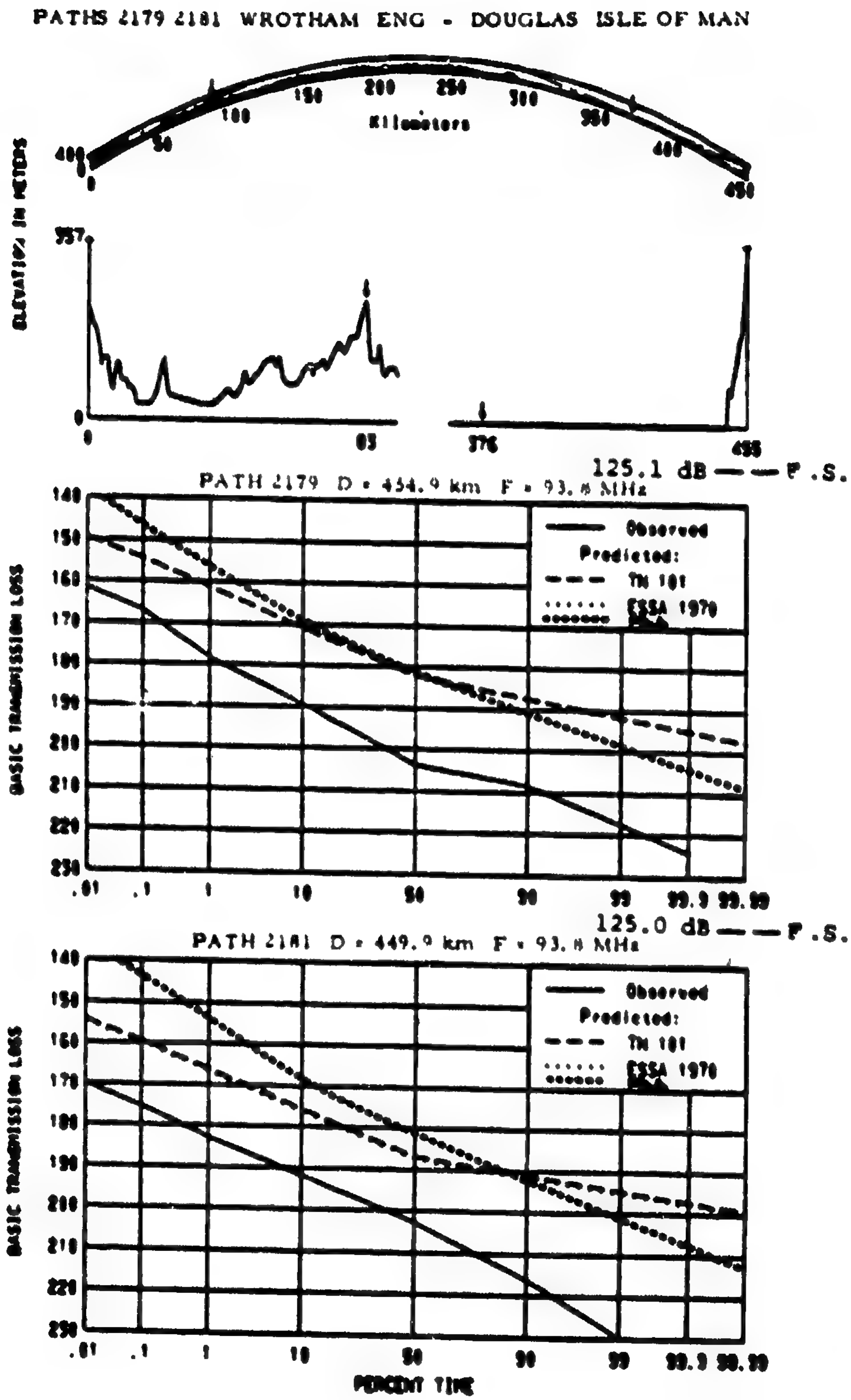


Figure 260. Paths 12179 and 12181, profile and predictions.

Path Number: _ _ _ 1 2 1 7 9

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Wrotham, England - Douglas (high site) Isle of Man*

Data type *5500 hourly medians*, Distance *454.9* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *93.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *103.4* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	350.5	356.6
gain [dBi], main beam		
height [m], above site surface	131	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	83.04	
elevation [m-msl]	237.7	
elevation angle [deg]		
Location, latitude	51°19'11"N	54°12'50"N
longitude	0°17'20"E	4°28'00"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.129

Figure 261. Path 12179, parameters.

Path Number: _ _ _ 1 2 1 8 1

Code Number: 1 1 2 0 3 0 0 4 5 3 1 1 3 1 1 1

Location: *Wrotham, England - Douglas (low site), Isle of Man*

Data type *2200 hourly medians*, Distance *449.9* km, h_{rs} *0* m-msl

N_s *317.* N-units, a *8766* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *93.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	350.5	35.1
gain [dBi], main beam		
height [m], above site surface		9.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	51°19'11"N	54°10'35"N
longitude	0°17'20"E	4°25'15"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.129

Figure 262. Path 12181, parameters.

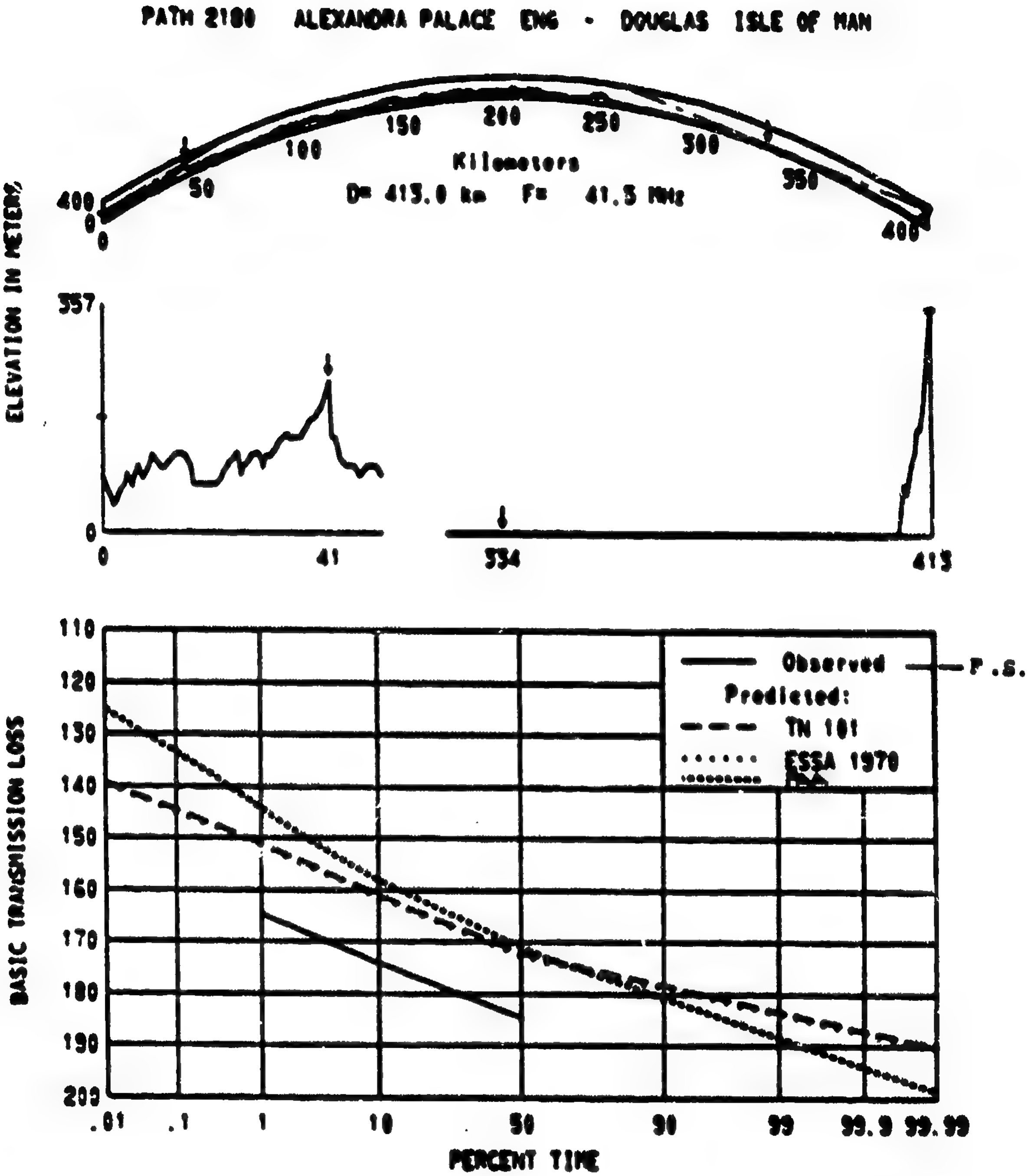


Figure 263. Path 12180, profile and predictions.

Path Number: _ _ _ 1 2 1 8 0

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 3 1 1 1

Location: *Alexandra Palace, England - Douglas (high site) Isle of Man*

Data type *3600 hourly medians*, Distance *413.0* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ____ km

Frequency *41.5* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *91.4* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	182.9	356.6
gain [dBi], main beam		
height [m], above site surface	91.5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	41.2	
elevation [m-msl]	239.3	
elevation angle [deg]		
Location, latitude	51°35'30"N	54°12'50"N
longitude	0°07'40"W	4°28'00"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.126

Figure 264. Path 12180, parameters.

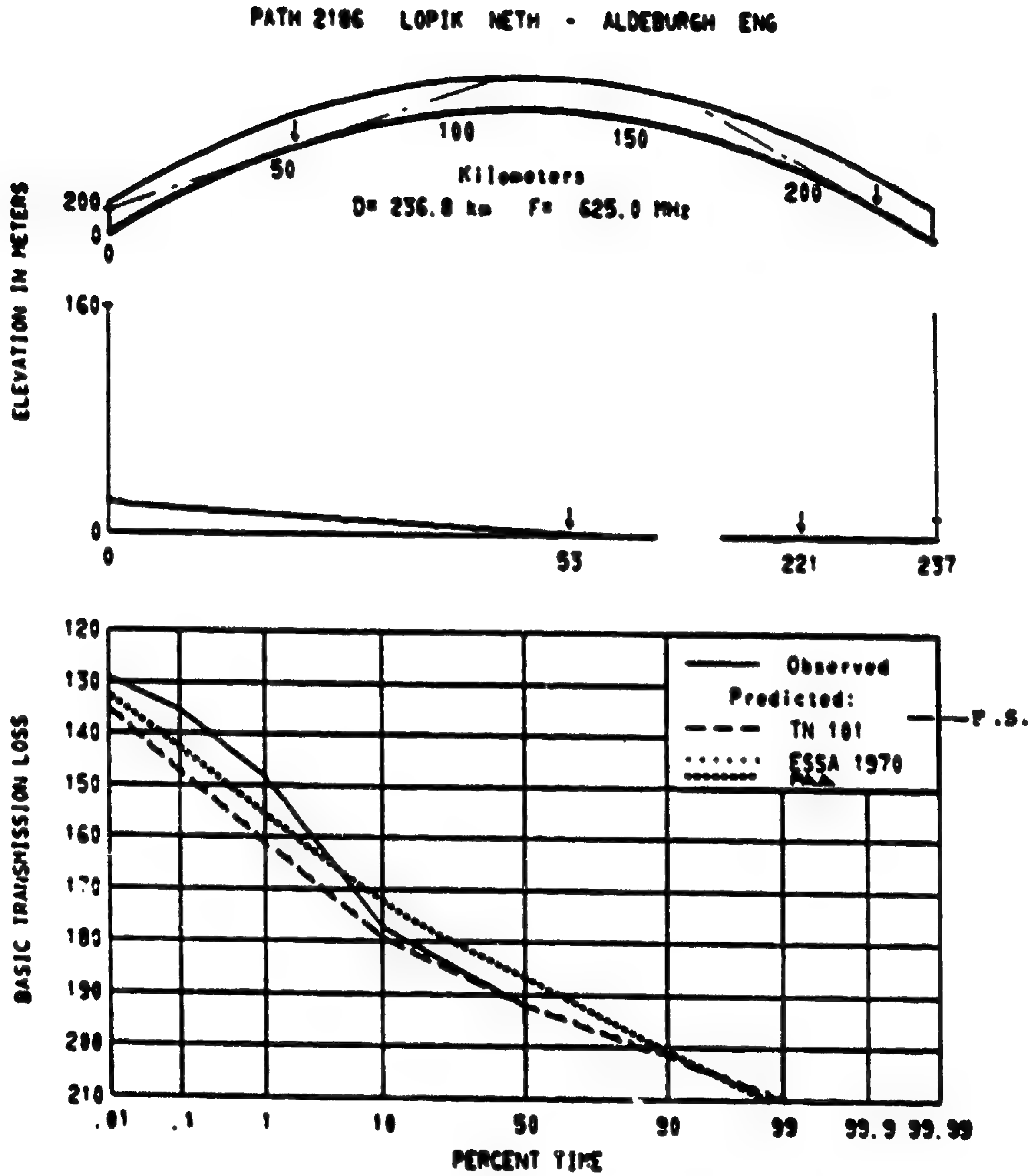


Figure 265. Path 12186, profile and predictions.

Path Number: _ _ _ 1 2 1 8 6

Code Number: 1 1 2 6 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Lopik, Netherlands - Aldeburgh, England*

Data type *8000 hourly medians*, Distance *236.8* km, h_{rs} *0* m-msl

N_s *318* N-units, a *8784* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ____ km

Frequency *625* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	160	14
gain [dBi], main beam		
height [m], above site surface		13.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	52°01'N	52°08'50"N
longitude	5°03'E	1°36'15"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.142

Figure 266. Path 12186, parameters.

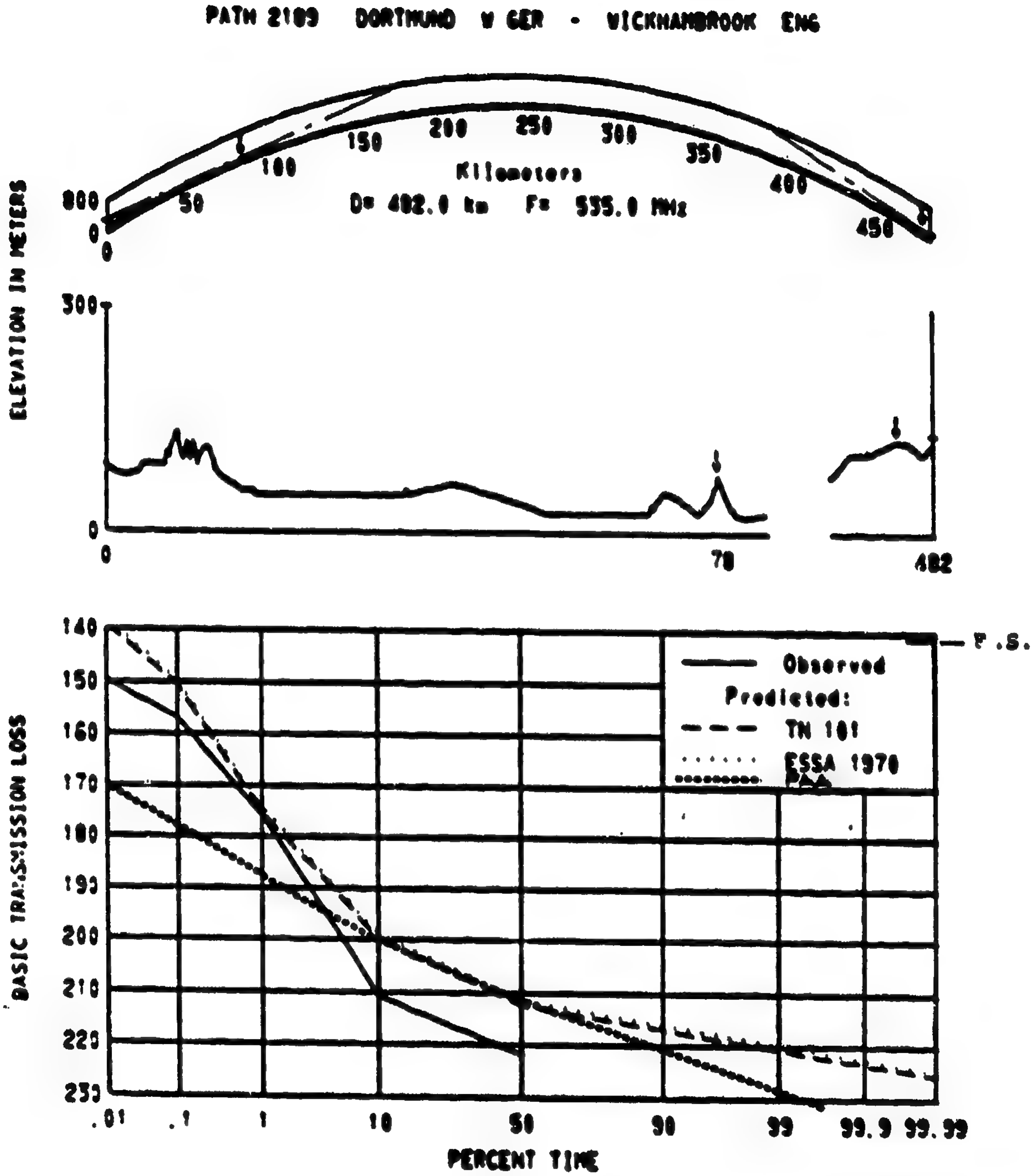


Figure 267. Path 12189, profile and predictions.

Path Number: _ _ _ 1 2 1 8 9

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 4 1 1

Location: *Dortmund, West Germany - Wickhambrook, England*

Data type *1900 hourly medians*, Distance *482.0* km, h_{rs} *0* m-msl

N_s *314* N-units, a *8711* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *535* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *64.4* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	299.9	134.1
gain [dBi], main beam		
height [m], above site surface		12.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		4.65
elevation [m-msl]		125
elevation angle [deg]		
Location, latitude	51°30'55"N	52°11'25"N
longitude	7°27'24"E	0°33'01"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.137

Figure 268. Path 12189, parameters.

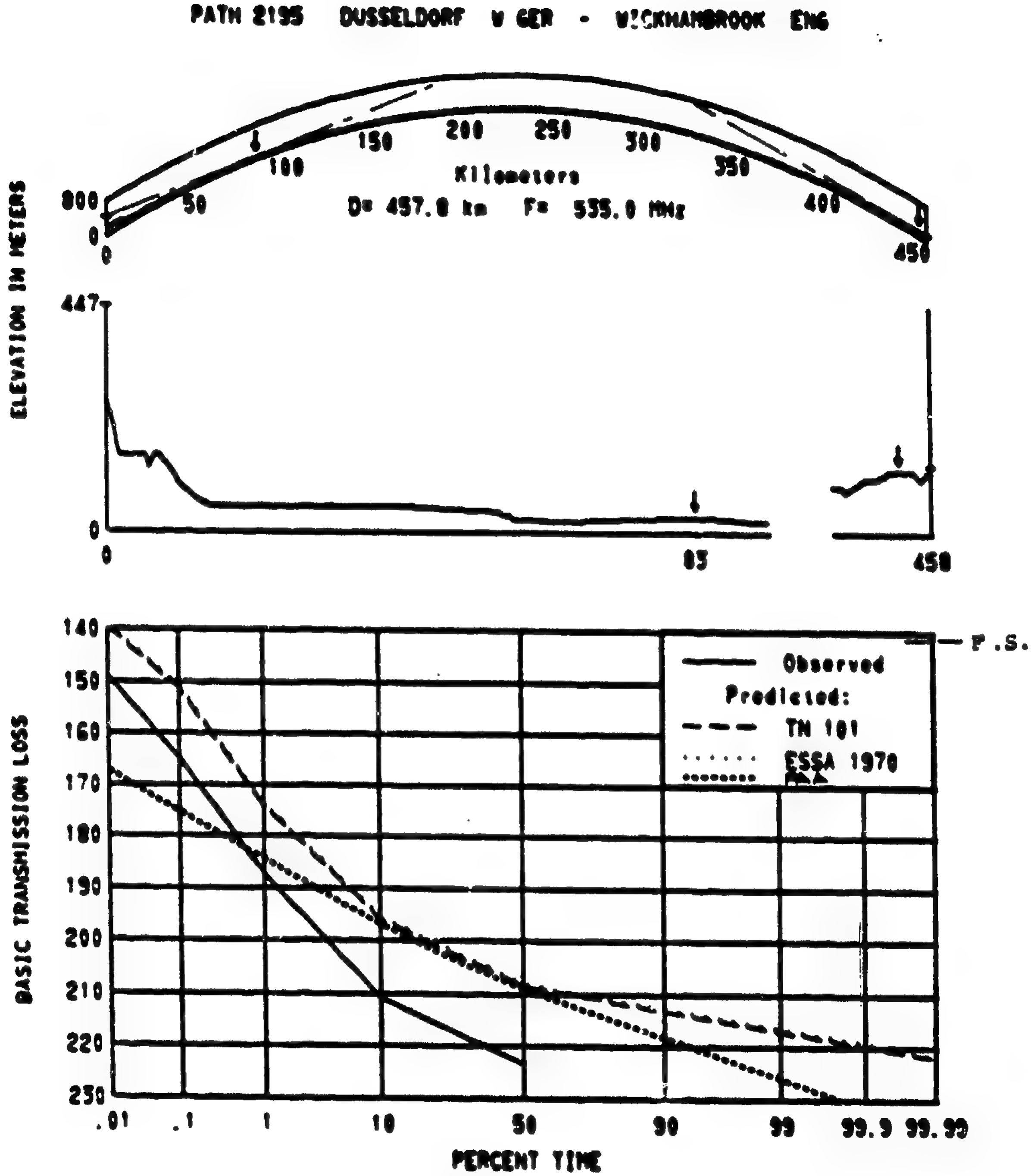


Figure 269. Path 12195, profile and predictions.

Path Number: _ _ _ 1 2 1 9 5

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 4 1 1

Location: *Dusseldorf, West Germany - Wickhambrook, England*

Data type *1 year of hourly medians*, Distance *457.8* km, h_{rs} *30* m-msl

N_s *315* N-units, a *8729* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *535* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *67.8* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	447.1	134.1
gain [dBi], main beam		
height [m], above site surface		12.2
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		4.5
elevation [m-msl]		125.3
elevation angle [deg]		
Location, latitude	51°20'N	52°11'25"N
longitude	7°02'E	0°33'01"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.139

Figure 270. Path 12195, parameters.

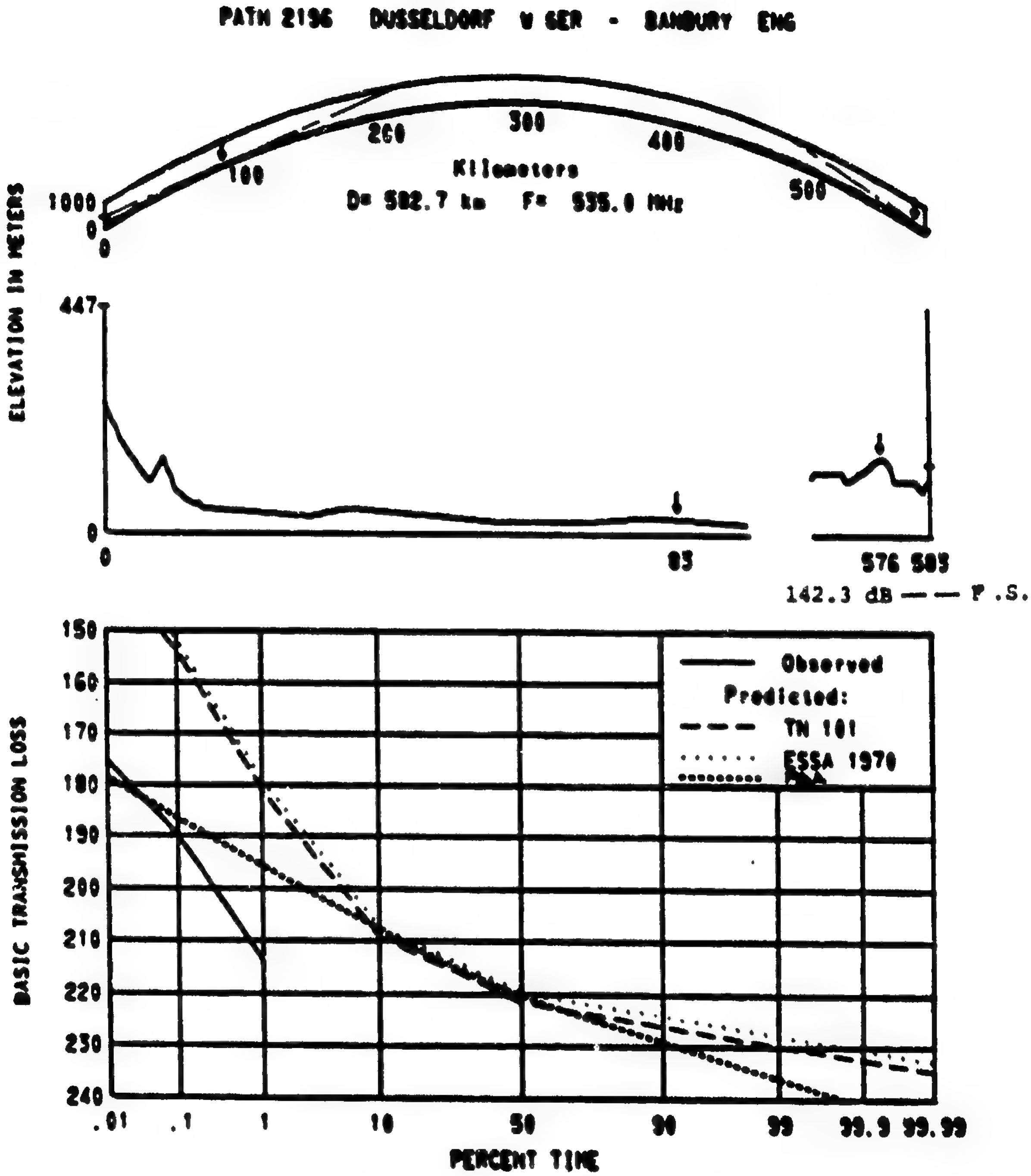


Figure 271. Path 12196, profile and predictions.

Path Number: _ _ _ 1 2 1 9 6

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 4 1 1

Location: *Dusseldorf, West Germany - Banbury, England*

Data type *13000 hourly medians*, Distance *582.7* km, h_{rs} *30* m-msl

N_s *315* N-units, a *8729* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *535* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *91.4* m, θ ______ mr.

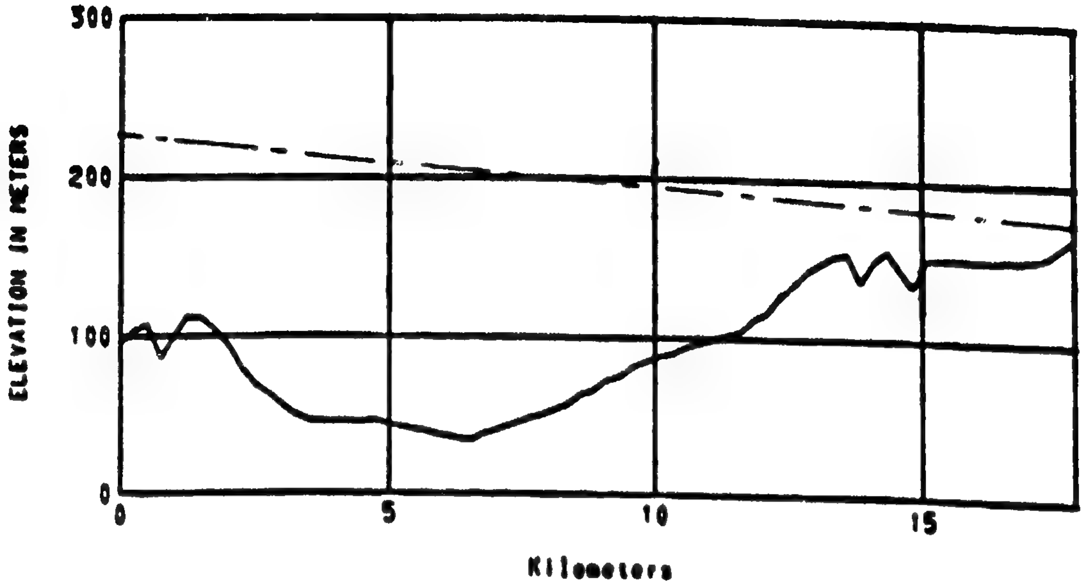
	Transmitter	Receiver
Antenna elevation [m-msl]	447.1	142
gain [dBi], main beam		
height [m], above site surface		31.4
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		7.1
elevation [m-msl]		153.
elevation angle [deg]		
Location, latitude	51°20'N	52°02'05"N
longitude	7°02'E	1°18'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.140

Figure 272. Path 12196, parameters.

CRYSTAL PALACE ENG - KINGSWOOD ENG
PATHS 2197 2198 2214



PATH 2197 D = 17.9 km F = 41.5 MHz

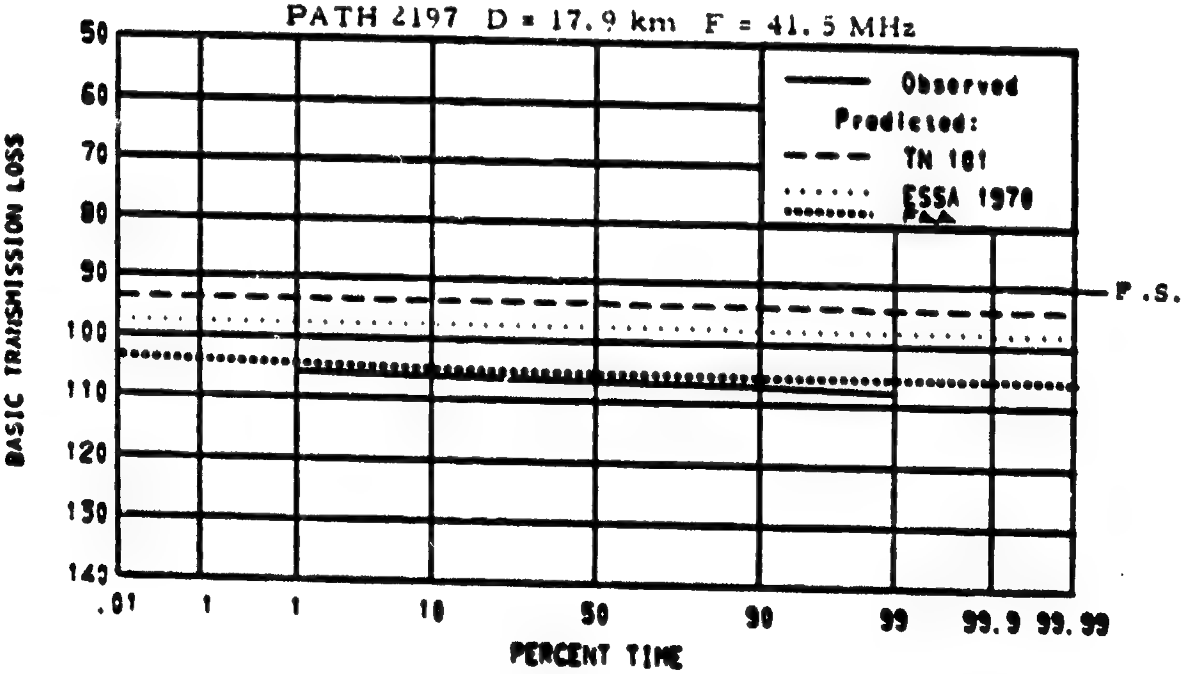


Figure 273. Path 12197, profile and predictions.

Path Number: _ _ _ 1 2 1 9 7

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 3 1 1 1

Location: *Crystal Palace, England - Kingswood, England*

Data type *1329 hourly medians*, Distance *17.9* km, h_{rs} *150* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *41.5* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

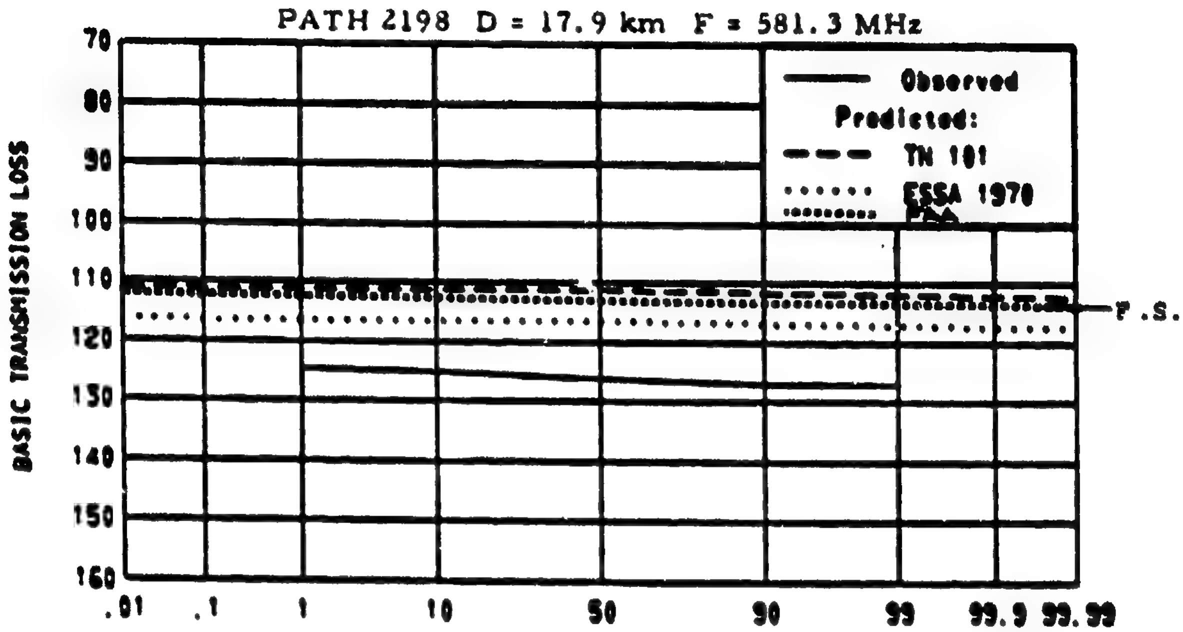
	Transmitter	Receiver
Antenna elevation [m-msl]	226.5	176.7
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	V	V
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	51°25'20"N	51°17'20"N
longitude	0°04'17"W	0°12'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.15

Figure 274. Path 12197, parameters.

CRYSTAL PALACE ENG - KINGSWOOD ENG



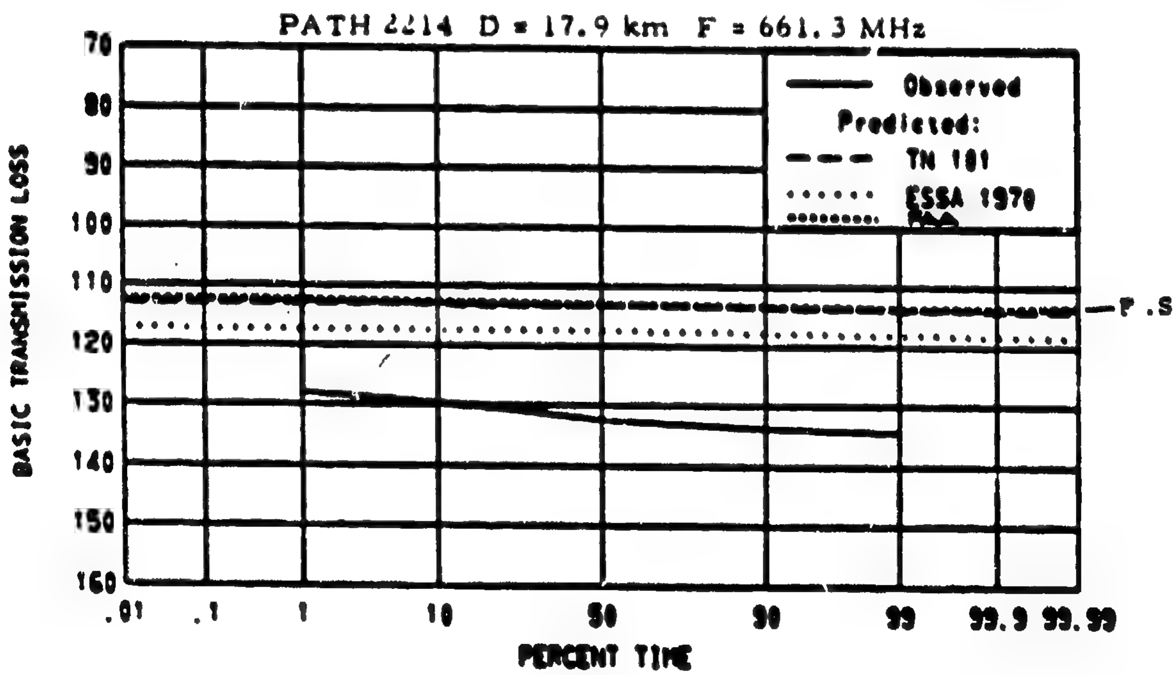


Figure 275. Paths 12198 and 12214, predictions. (see Figure 273 for profile)

Path Number: _ _ _ 1 2 1 9 8

Code Number: 1 1 2 5 1 0 0 4 5 2 1 1 3 1 1 1

Location: *Crystal Palace, England - Kingswood, England*

Data type *958 hourly medians*, Distance *17.9* km, h_{rs} *150* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *581.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	295.	176.7
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	51°25'20"N	51°17'20"N
longitude	0°04'17"W	0°12'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.16

Figure 276. Path 12198, parameters.

Path Number: _ _ _ 1 2 2 1 4

Code Number: 1 1 2 6 1 0 0 4 5 2 1 1 3 1 1 1

Location: *Crystal Palace, England - Kingswood, England*

Data type *1329 hourly medians*, Distance *17.9* km, h_{rs} *150* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *661.2* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	307.2	176.7
gain [dBi], main beam		
height [m], above site surface		9.1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	51°25'20"N	51°17'20"N
longitude	0°04'17"W	0°12'50"W
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.16

Figure 277. Path 12214, parameters.

PATHS 2199 2216 DORTMUND W GER - ALDEBURGH ENG

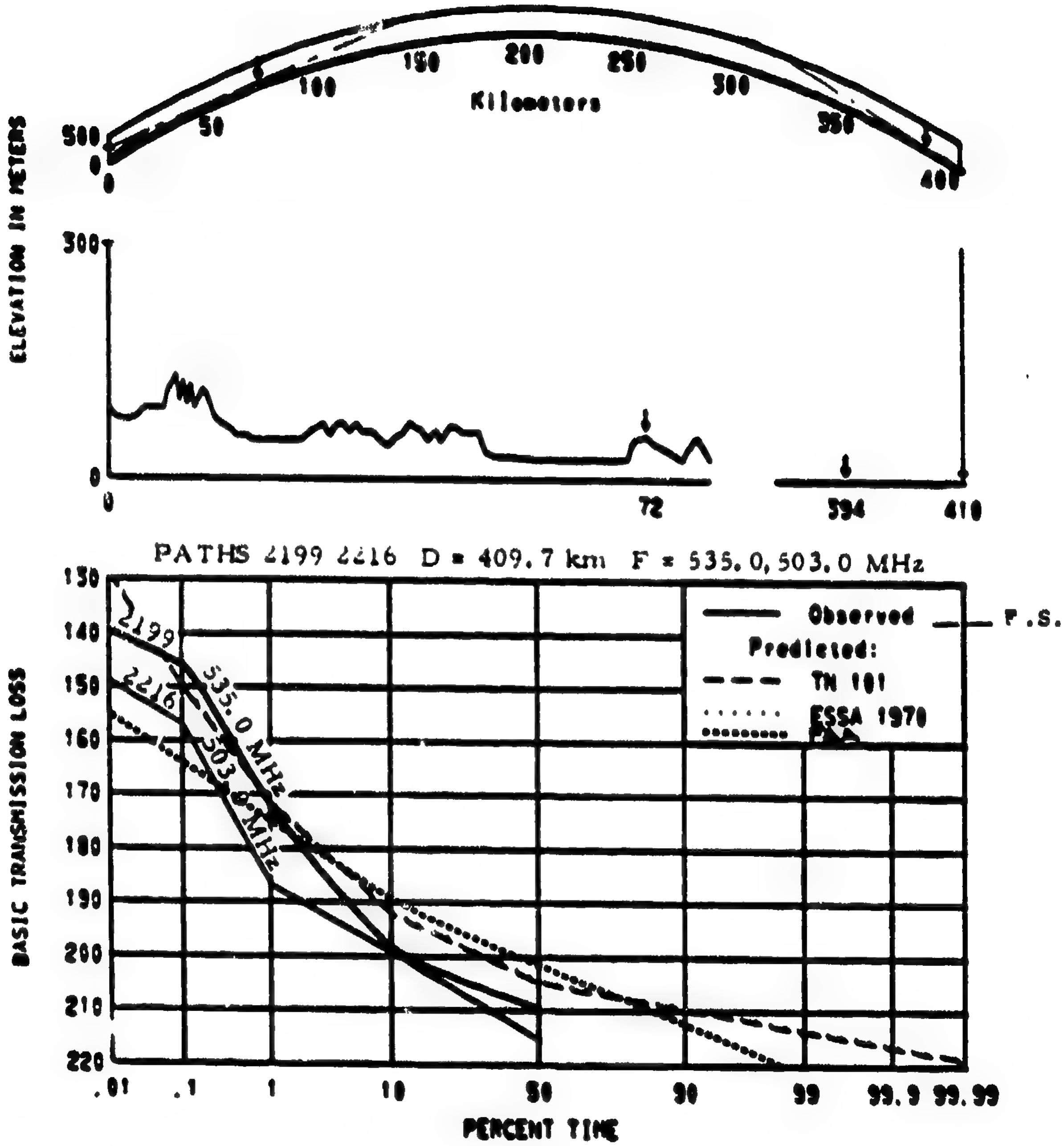


Figure 278. Paths 12199 and 12216, profile and predictions.

Path Number: _ _ _ 1 2 1 9 9

Code Number: 1 1 2 5 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Dortmund, West Germany - Aldeburgh, England*

Data type *5000 hourly medians*, Distance *409.7* km, h_{rs} *0* m-msl

N_s *316* N-units, a *8747* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *535* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	299.9	14
gain [dBi], main beam		
height [m], above site surface		13.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	51°30'55"N	52°08'50"N
longitude	7°27'24"E	1°36'15"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.136

Figure 279. Path 12199, parameters.

Path Number: _ _ _ 1 2 2 1 6

Code Number: 1 1 2 5 3 0 0 4 5 3 1 1 3 4 1 1

Location: *Dortmund, West Germany - Aldeburgh, England*

Data type *2 months of hourly medians*, Distance *409.7* km, h_{rs} *0* m-msl

N_s *316* N-units, a *8747* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *503* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	299.9	14
gain [dBi], main beam		
height [m], above site surface		13.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	51°30'55"N	52°08'50"N
longitude	7°27'24"E	1°36'15"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.136

Figure 280. Path 12216, parameters.

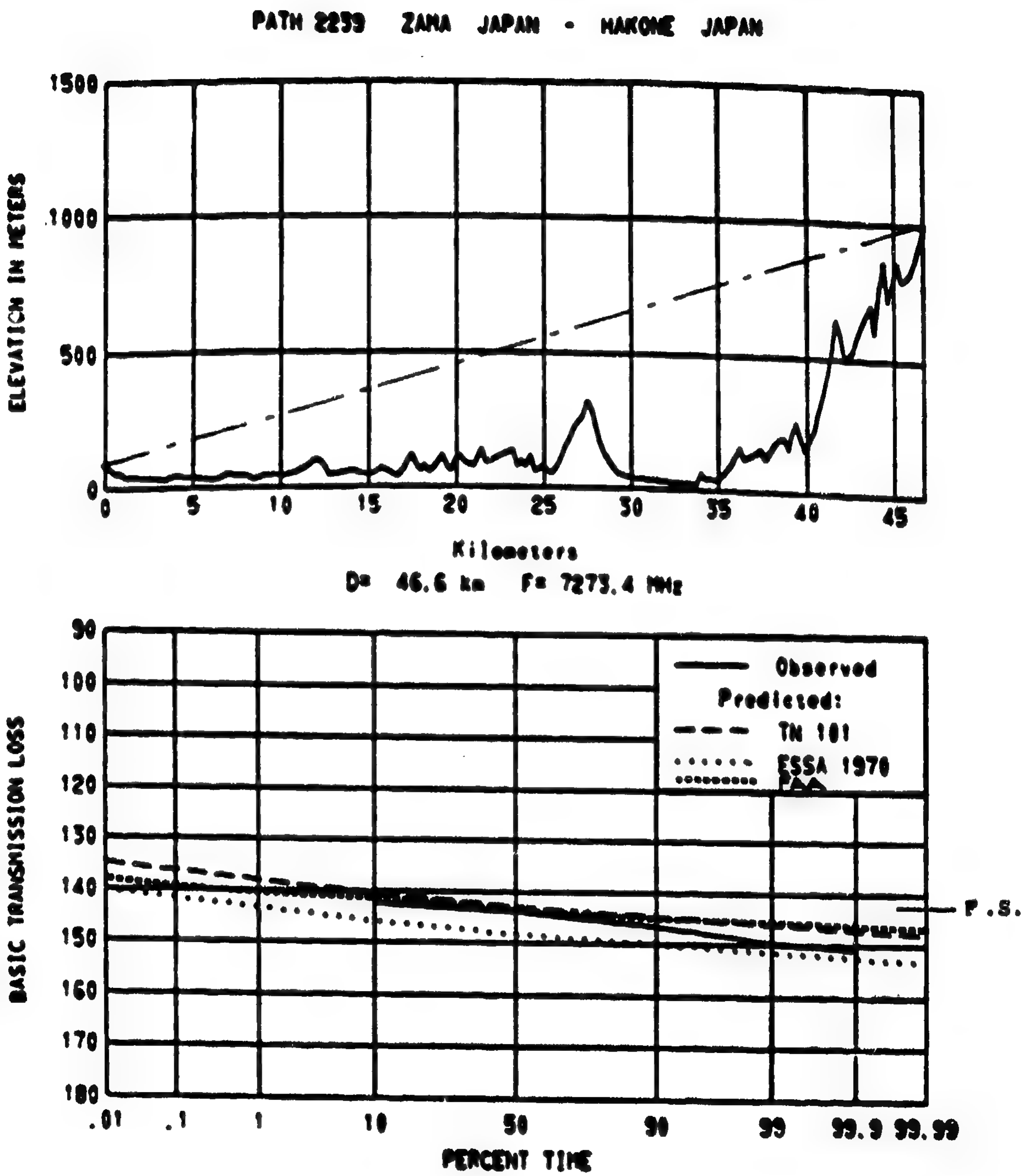


Figure 281. Path 12239, profile and predictions.

Path Number: _ _ _ 1 2 2 3 9

Code Number: 1 1 3 7 1 0 0 4 5 2 1 1 4 5 1 1

Location: *Zama, Japan - Hakone, Japan*

Data type *2100 hourly medians*, Distance *46.6* km, h_{rs} *82* m-msl

N_s *301* N-units, a *8493* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *7273.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *548.6* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	85.9	1003.6
gain [dBi], main beam		
height [m], above site surface	3.9	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		46.6
elevation [m-msl]		999.7
elevation angle [deg]		
Location, latitude	35°29'52"N	35°11'08"N
longitude	139°24'04"E	139°03'27"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.26

Figure 282. Path 12239, parameters.

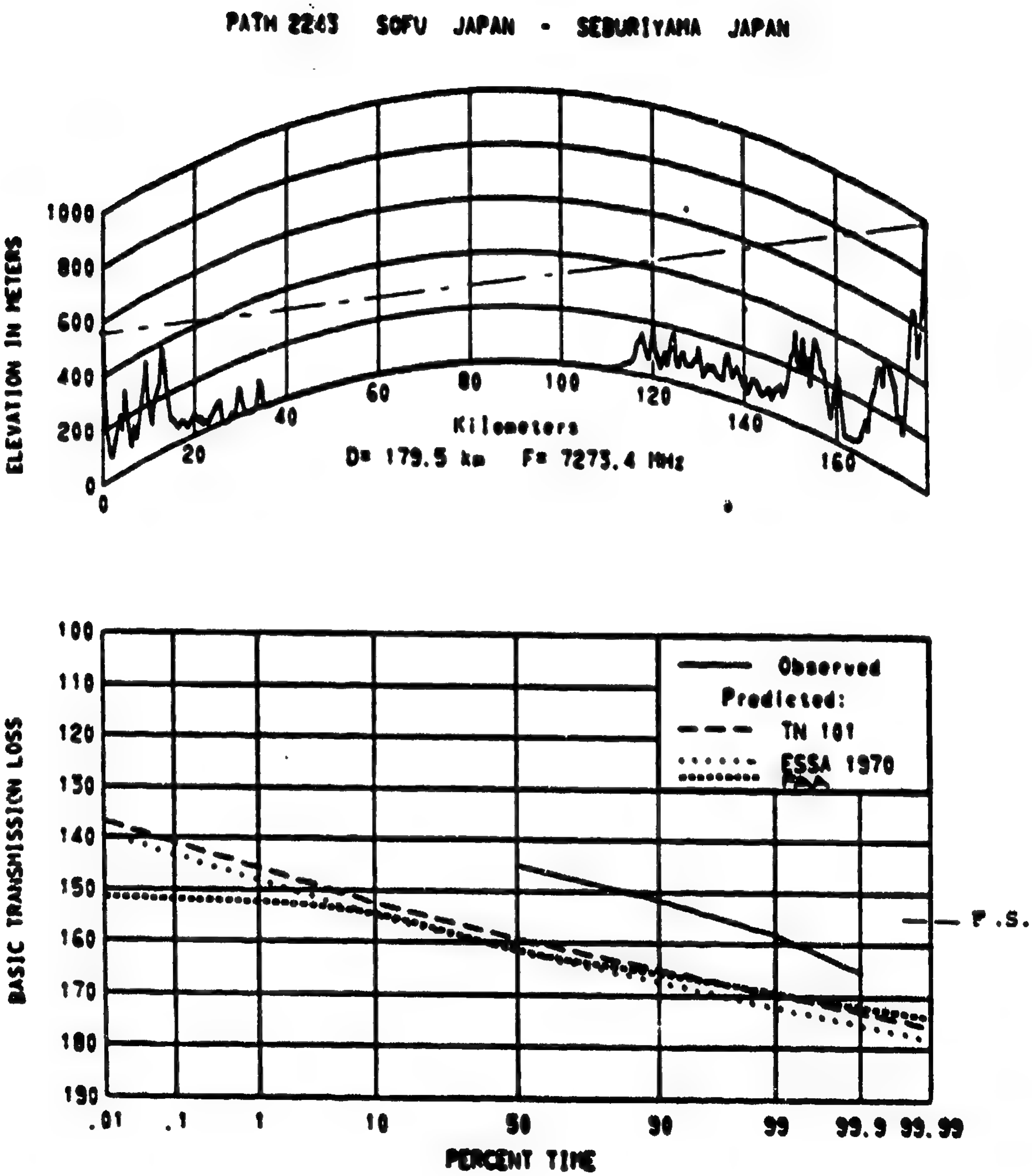


Figure 283. Path 12243; profile and predictions.

Path Number: _ _ _ 1 2 2 4 3

Code Number: 1 1 3 7 1 0 0 1 5 3 1 1 4 5 1 1

Location: Sofu, Japan - Seburiyama, Japan

Data type 800 hourly medians, Distance 179.5 km, h_{rs} 0 m-msl

N_s 301 N-units, a 8493 km, Surface type sea water

Climate continental temperate, de ____ km

Frequency 7273.4 MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh 0 m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	561	989
gain [dBi], main beam		
height [m], above site surface	6	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	34°04'06"N	33°25'17"N
longitude	132°09'21E	130°22'46"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.29

Figure 284. Path 12243, parameters.

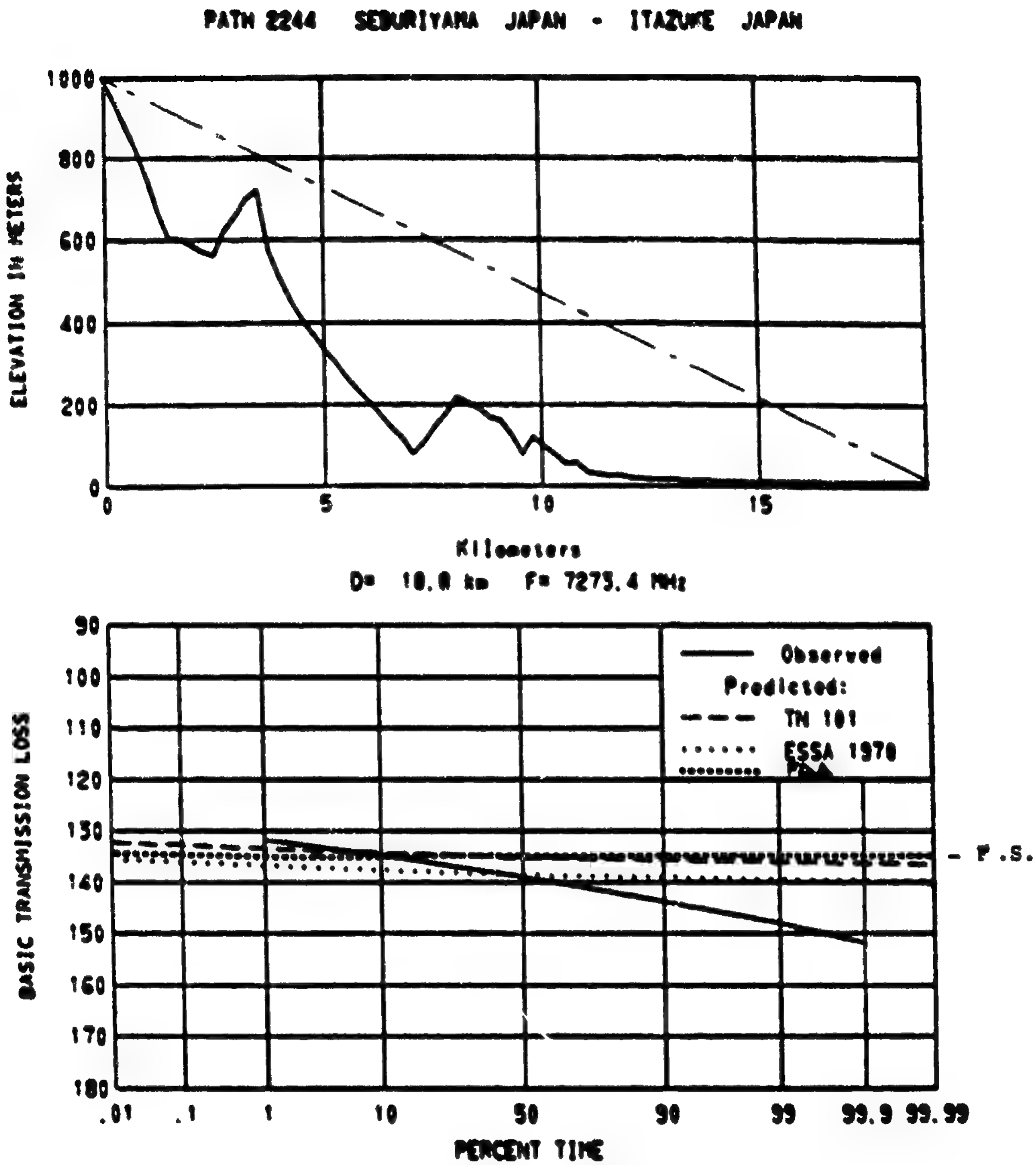


Figure 285. Path 12244, profile and predictions.

Path Number: _ _ _ 1 2 2 4 4

Code Number: 1 1 3 7 1 0 0 4 5 2 1 1 4 5 1 1

Location: *Seburiyama, Japan - Itazuke, Japan*

Data type *700 hourly medians*, Distance *18.8* km, h_{rs} *9.1* m-msl

N_s *301* N-units, a *8493* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *7273.4* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *697.4* m, θ ____ mr.

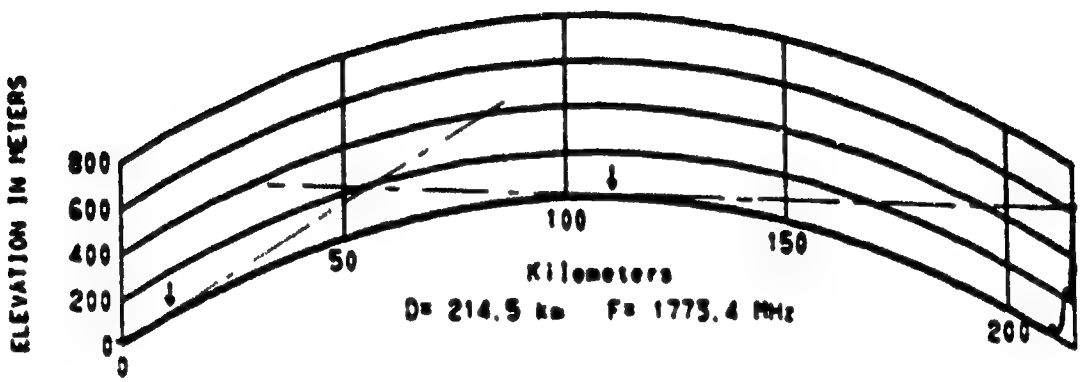
	Transmitter	Receiver
Antenna elevation [m-msl]	998.2	13
gain [dBi], main beam		
height [m], above site surface		3.9
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		18.8
elevation [m-msl]		983.
elevation angle [deg]		
Location, latitude	33°25'17"N	33°34'57"N
longitude	130°22'46"E	130°26'35"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.25

Figure 286. Path 12244, parameters.

PATH 2245 ITAZUKE JAPAN - CHANGSAN JAPAN



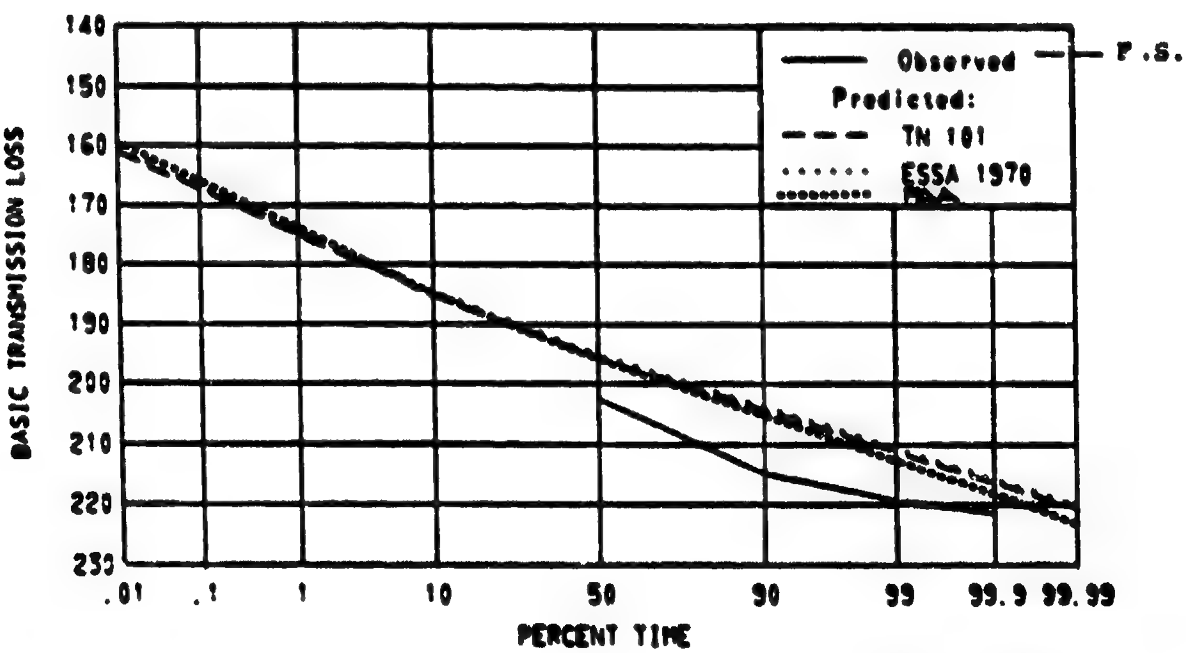


Figure 287. Path 12245, profile and predictions.

Path Number: _ _ _ 1 2 2 4 5

Code Number: 1 1 3 1 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Itazuke, Japan - Changsan, Japan*

Data type *1400 hourly medians*, Distance *214.5* km, h_{rs} *0* m-msl

N_s *314* N-units, a *8711* km, Surface type *sea water*

Climate *continental temperate*, de ______ km

Frequency *1773.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	17.1	623
gain [dBi], main beam		
height [m], above site surface	8.0	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	10.90	
elevation [m-msl]	10	
elevation angle [deg]		
Location, latitude	33°34'57"N	35°11'27"N
longitude	130°26'35"E	129°08'48"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.173

Figure 288. Path 12245, parameters.

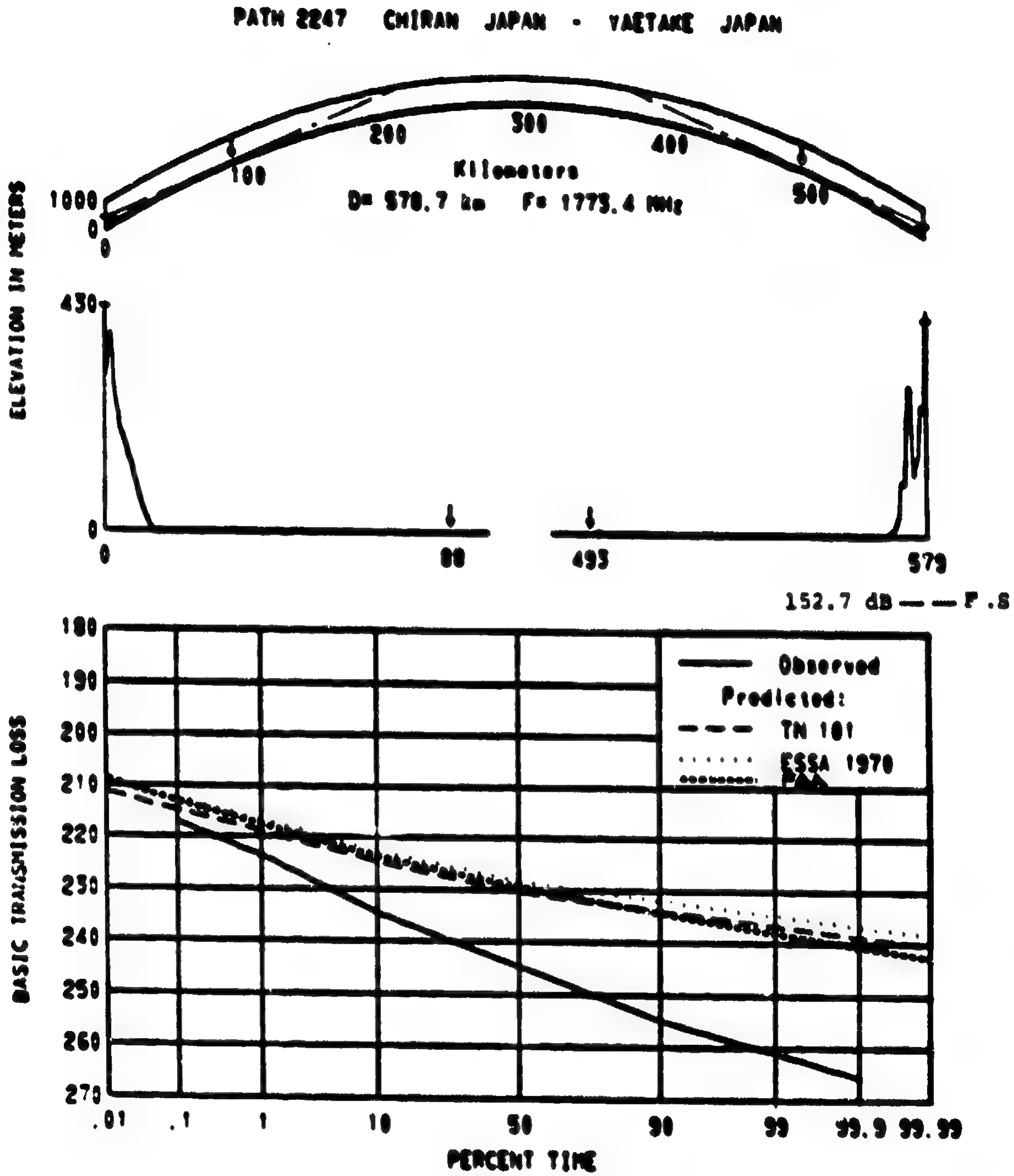


Figure 289. Path 12247, profile and predictions.

Path Number: _ _ _ 1 2 2 4 7

Code Number: 1 1 3 1 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Chiran, Japan - Yaetake, Japan*

Data type *2500 hourly medians*, Distance *578.7* km, h_{rs} *0* m-msl

N_s *327* N-units, a *8959* km, Surface type *sea water*

Climate *continental temperate*, de ______ km

Frequency *1773.4* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	429.5	414.8
gain [dBi], main beam		
height [m], above site surface		12.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	31°20'31"N	26°37'48"N
longitude	130°29'25"E	127°55'22"E
Path bearing		
elevation [m-msl]		
Other information:		

OT/TRER 16, fig. 3.192

Figure 290. Path 12247, parameters.

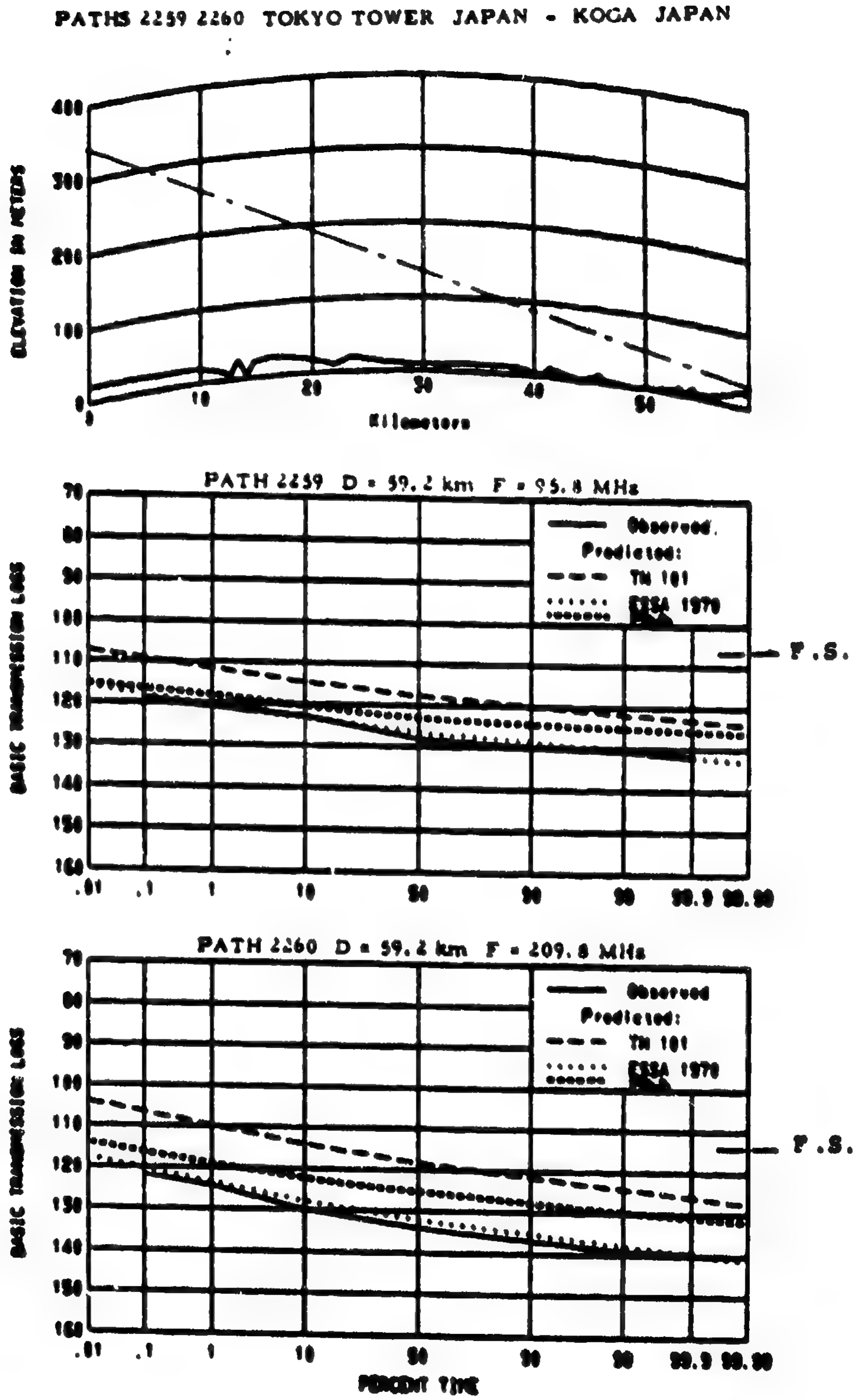


Figure 291. Paths 12259 and 12260, profile and predictions.

Path Number: _ _ _ 1 2 2 5 9

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 4 5 1 1

Location: *Tokyo Tower, Japan - Koga, Japan*

Data type *655 hourly medians*, Distance *59.2* km, h_{rs} *75* m-msl

N_s *309* N-units, a *8624* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *95.8* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *10.5* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	340.2	29
gain [dBi], main beam		
height [m], above site surface		10
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		18.
elevation [m-msl]		10.
elevation angle [deg]		
Location, latitude	35°39'18.1"N	36°11'14.5"N
longitude	~~139°44'56.4"E~~	139°42'19.8"E
Path bearing		
elevation [m-msl]		
Other information:		

OT/TRER 16, fig. 1.27

Figure 292. Path 12259, parameters.

Path Number: _ _ _ 1 2 2 6 0

Code Number: 1 1 2 2 1 0 0 4 5 2 1 1 4 5 1 1

Location: *Tokyo Tower, Japan - Koga, Japan*

Data type *889 hourly medians*, Distance 59.2 km, h_{rs} 15 m-msl

N_s 309 N-units, a 8624 km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency 209.8 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 10.5 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	317.6	29
gain [dBi], main beam		
height [m], above site surface		10
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		18.
elevation [m-msl]		10.
elevation angle [deg]		
Location, latitude	35°39'18.1"N	36°11'14.5"N
longitude	139°44'56.4"E	139°42'19.8"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.27

Figure 293. Path 12260, parameters.

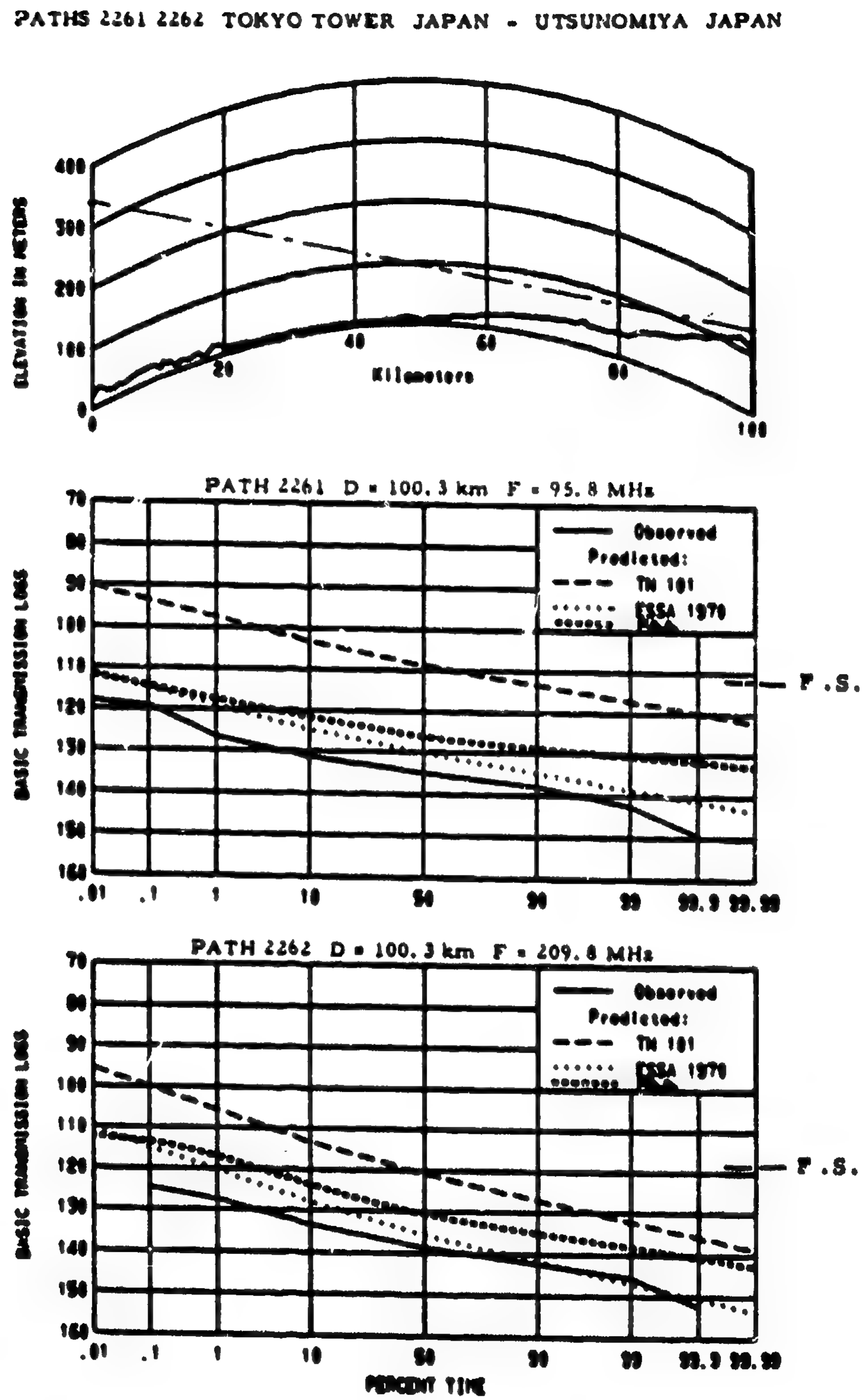


Figure 294. Paths 12261 and 12262, profile and predictions.

Path Number: _ _ _ 1 2 2 6 1

Code Number: 1 1 2 0 1 0 0 4 5 2 1 1 4 5 1 1

Location: *Tokyo Tower, Japan - Utsunomiya, Japan*

Data type *4889 hourly medians*, Distance *100.3* km, h_{rs} *50.* m-msl

N_s *302* N-units, a *8509* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *95.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	340.2	139
gain [dBi], main beam		
height [m], above site surface		10
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	35°39'18.1"N	36°33'24.3"N
longitude	139°44'56.4"E	139°49'47.3"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.28

Figure 295. Path 12261, parameters.

Path Number: _ _ _ 1 2 2 6 2

Code Number: 1 1 2 2 1 0 0 4 5 2 1 1 4 5 1 1

Location: *Tokyo Tower, Japan - Utsunomiya, Japan*

Data type *3675 hourly medians*, Distance *100.3* km, h_{rs} *50.* m-msl

N_s *302* N-units, a *8509* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *209.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	317.6	139
gain [dBi], main beam		
height [m], above site surface		10
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	35°39'18.1"N	36°33'24.3"N
longitude	139°44'56.4"E	139°49'47.3"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.28

Figure 296. Path 12262, parameters.

PATHS 2266 2267 TOKYO JAPAN - HACHIJO JAPAN

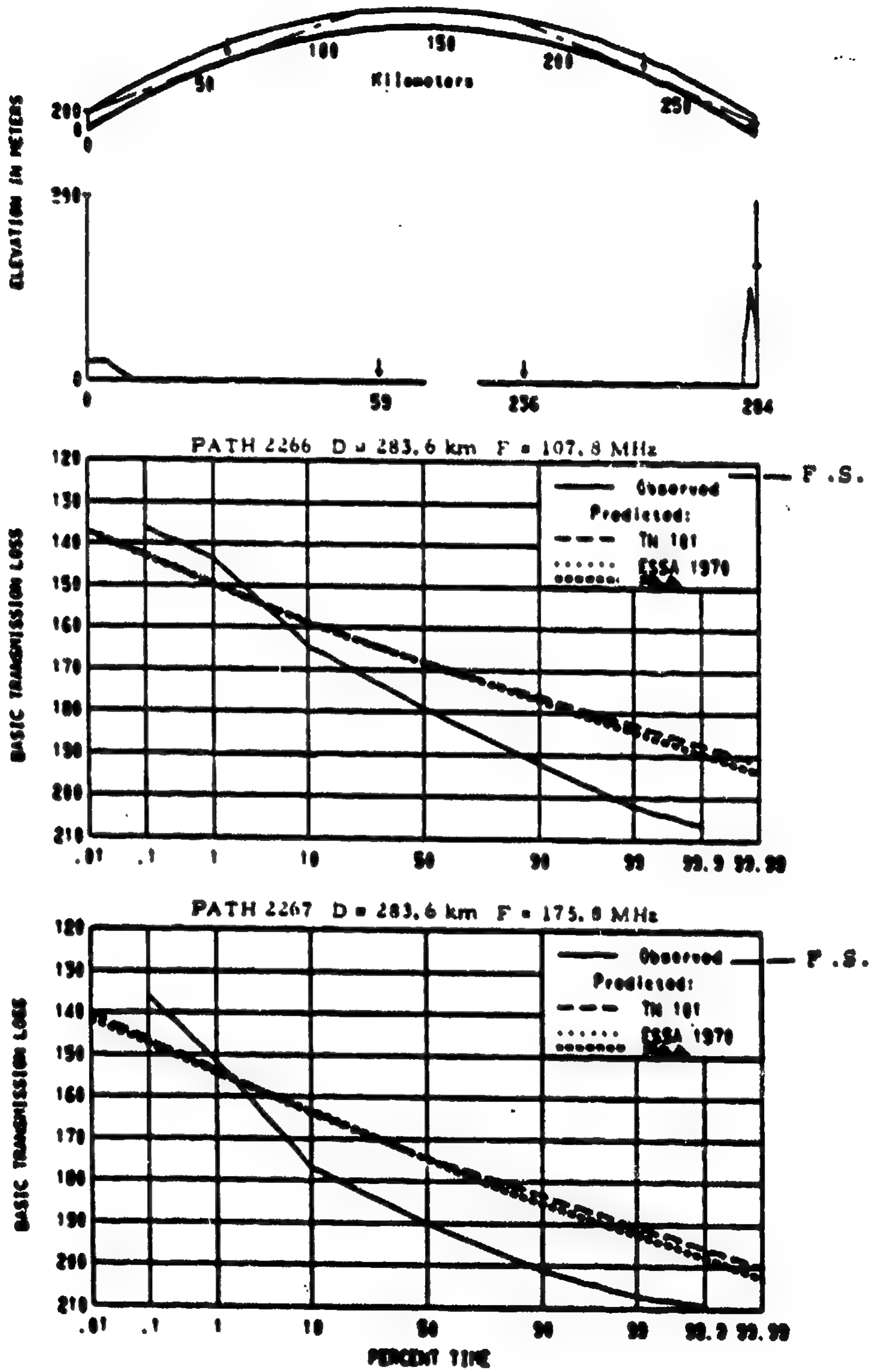


Figure 297. Paths 12266 and 12267, profile and predictions.

Path Number: _ _ _ 1 2 2 6 6

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Tokyo Tower, Japan - Hachijo, Japan*

Data type *2163 hourly medians*, Distance *283.6* km, h_{rs} *0* m-msl

N_s *310* N-units, a *8641* km, Surface type *sea water*

Climate *continental temperate*, de ____ km

Frequency *107.8* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	200	130
gain [dBi], main beam		
height [m], above site surface		80
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	35°40'20"N	33°06'55"N
longitude	139°44'25"E	139°47'50"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.178

Figure 298. Path 12266, parameters.

Path Number: _ _ _ 1 2 2 6 7

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Tokyo Tower, Japan - Hachijo, Japan*

Data type *1129 hourly medians*, Distance *283.6* km, h_{rs} *0* m-msl

N_s *310* N-units, a *8641* km, Surface type *sea water*

Climate *continental temperate*, de ______ km

Frequency *175.8* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	200	130
gain [dBi], main beam		
height [m], above site surface		80
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	35°40'20"N	33°06'55"N
longitude	139°44'25"E	139°47'50"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.178

Figure 299. Path 12267, parameters.

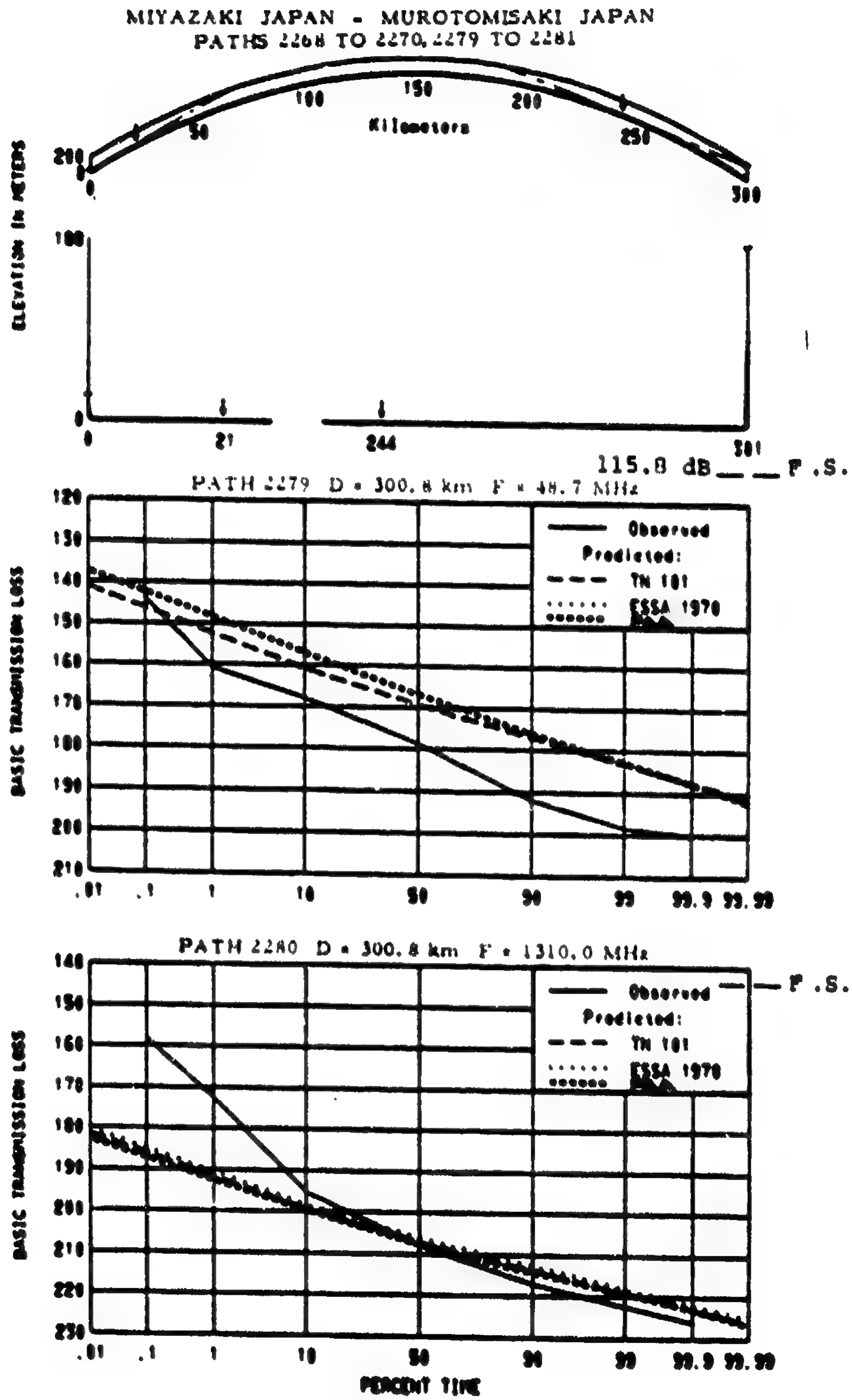


Figure 300. Paths 12279 and 12280, profile and predictions.

Path Number: _ _ _ 1 2 2 7 9

Code Number: 1 1 2 0 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Miyazaki, Japan - Murotomisaki, Japan*

Data type *1787 hourly medians*, Distance *300.8* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *continental temperate*, de ___ km

Frequency *48.7* MHz, Transmitter output ___ dBW, EIRP ___ dBW

Δh *0* m, θ ___ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	*25*	*188*
gain [dBi], main beam		
height [m], above site surface	*10*	
line loss [dB]		
polarization	*H*	*H*
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	*31°48'00"N*	*33°14'38"N*
longitude	*131°27'56"E*	*134°10'39"E*
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.181

Figure 301. Path 12279, parameters.

Path Number: _ _ _ 1 2 2 8 0

Code Number: 1 1 3 1 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Miyazaki, Japan - Murotomisaki, Japan*

Data type *1744 hourly medians*, Distance *300.8* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *continental temperate*, de ______ km

Frequency *1310* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	20	185
gain [dBi], main beam		
height [m], above site surface	5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	31°48'00"N	33°14'38"N
longitude	131°27'56"E	134°10'39"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.181

Figure 302. Path 12280, parameters.

MIYAZAKI JAPAN - MUROTOMISAKI JAPAN

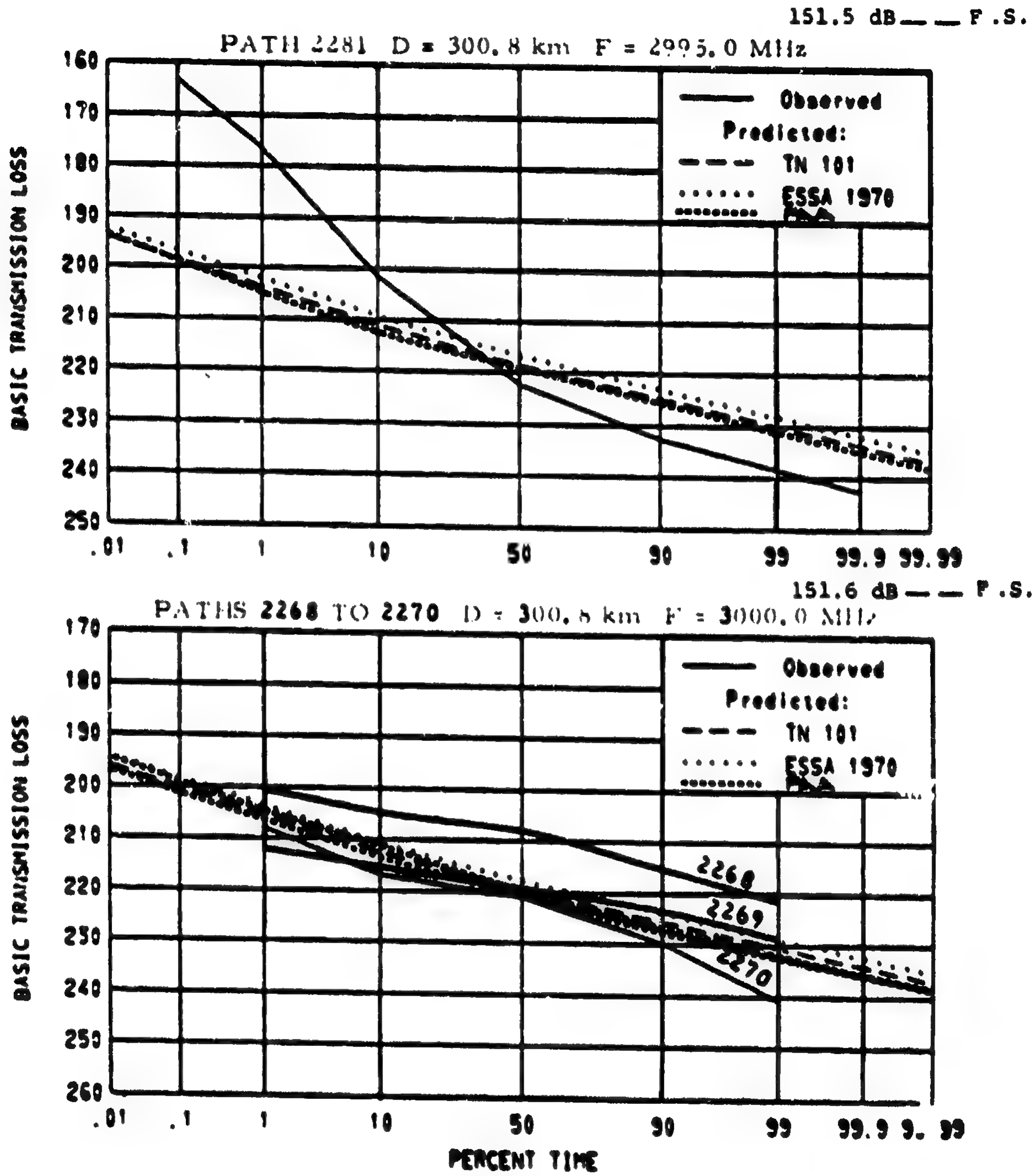


Figure 303. Paths 12281 and 12268 through 12270, predictions.
(see Figure 300 for profile)

Path Number: _ _ _ 1 2 2 8 1

Code Number: 1 1 3 2 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Miyazaki, Japan - Murotomisaki, Japan*

Data type *1668 hourly medians*, Distance *300.8* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *continental temperate*, de ____ km

Frequency *2995* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	20	185
gain [dBi], main beam		
height [m], above site surface	5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	31°48'00"N	33°14'38"N
longitude	131°27'56"E	134°10'39"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.182

Figure 304. Path 12281, parameters.

Path Number: _ _ _ 1 2 2 6 8

Code Number: 1 1 3 3 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Miyazaki, Japan - Murotomisaki, Japan*

Data type *339 hourly medians*, Distance *300.8* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *continental temperate*, de ______ km

Frequency *3000* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	20	185
gain [dBi], main beam		
height [m], above site surface	5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	31°48'00"N	33°14'38"N
longitude	131°27'56"E	134°10'39"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.182

Figure 305. Path 12268, parameters.

Path Number: _ _ _ 1 2 2 6 9

Code Number: 1 1 3 3 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Miyazaki, Japan - Murotomisaki, Japan*

Data type *364 hourly medians*, Distance *300.8* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *continental temperate*, de ____ km

Frequency *3000* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	20	151.5
gain [dBi], main beam		
height [m], above site surface	5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	31°48'00"N	33°14'38"N
longitude	131°27'56"E	134°10'39"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.182

Figure 306. Path 12269, parameters.

Path Number: _ _ _ 1 2 2 7 0

Code Number: 1 1 3 3 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Miyazaki, Japan - Murotomisaki, Japan*

Data type *334 hourly medians*, Distance *300.8* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *continental temperate*, de ____ km

Frequency *3000* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *0* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	20	107
gain [dBi], main beam		
height [m], above site surface	5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	31°48'00"N	33°14'38"N
longitude	131°27'56"E	134°10'39"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.182

Figure 307. Path 12270, parameters.

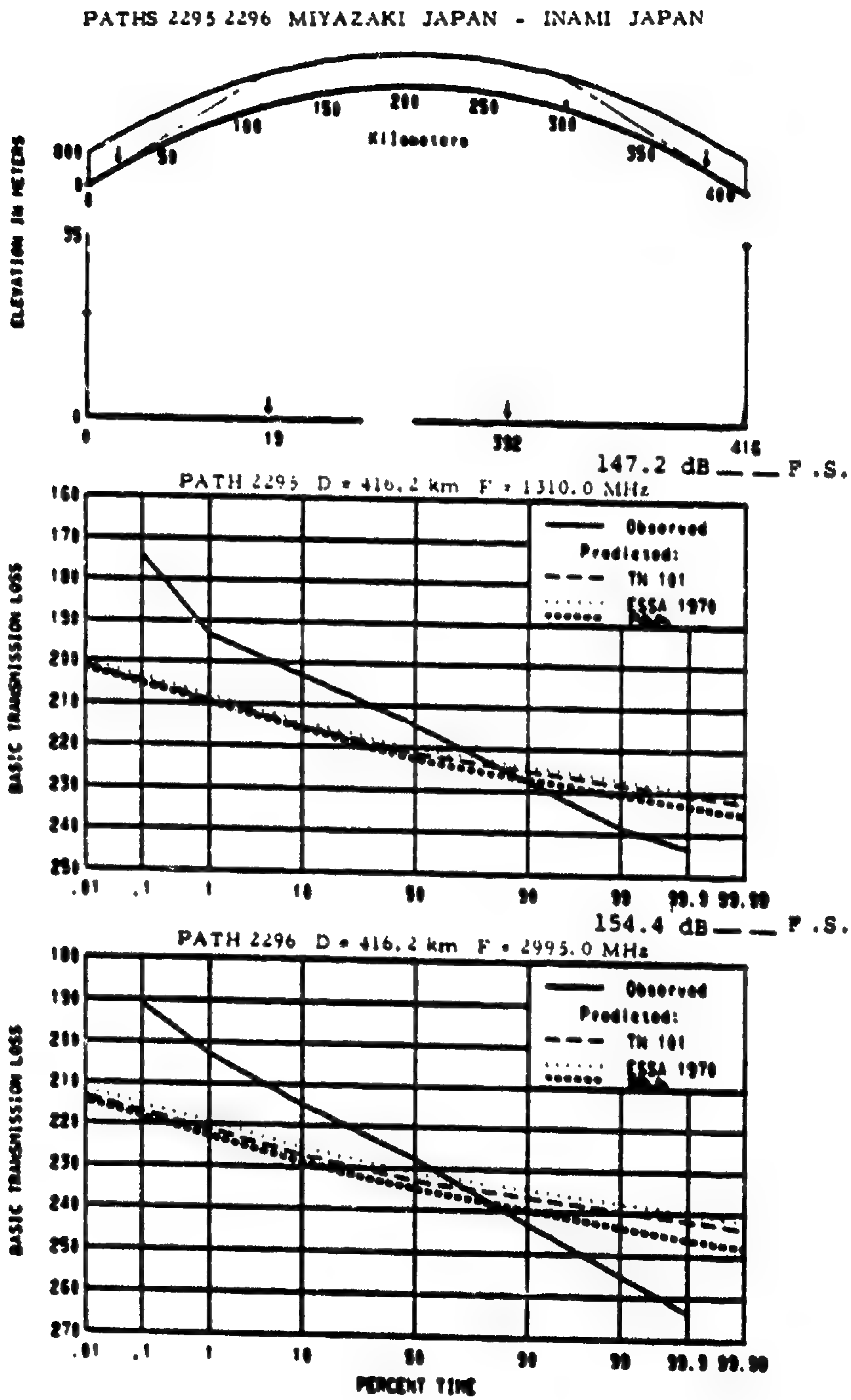


Figure 308. Paths 12295 and 12296, profile and predictions.

Path Number: _ _ _ 1 2 2 9 5

Code Number: 1 1 3 1 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Miyazaki, Japan - Inami, Japan*

Data type *1573 hourly medians*, Distance *416.2* km, h_{rs} *0* m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *continental temperate*, de ______ km

Frequency *1310* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	20	35
gain [dBi], main beam		
height [m], above site surface	5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	31°48'00"N	33°48'11"N
longitude	131°27'56"E	135°13'32"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.189

Figure 309. Path 12295, parameters.

Path Number: _ _ _ 1 2 2 9 6

Code Number: 1 1 3 2 3 0 0 4 5 3 1 1 4 5 1 1

Location: *Miyazaki, Japan - Inami, Japan*

Data type *1674 hourly medians*, Distance *416.2* km, h_{rs} ______ m-msl

N_s *306* N-units, a *8574* km, Surface type *sea water*

Climate *continental temperate*, de ______ km

Frequency *2995* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	20	35
gain [dBi], main beam		
height [m], above site surface	5	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	31°48'00"N	33°48'11"N
longitude	131°27'56"E	135°13'32"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.189

Figure 310. Path 12296, parameters.

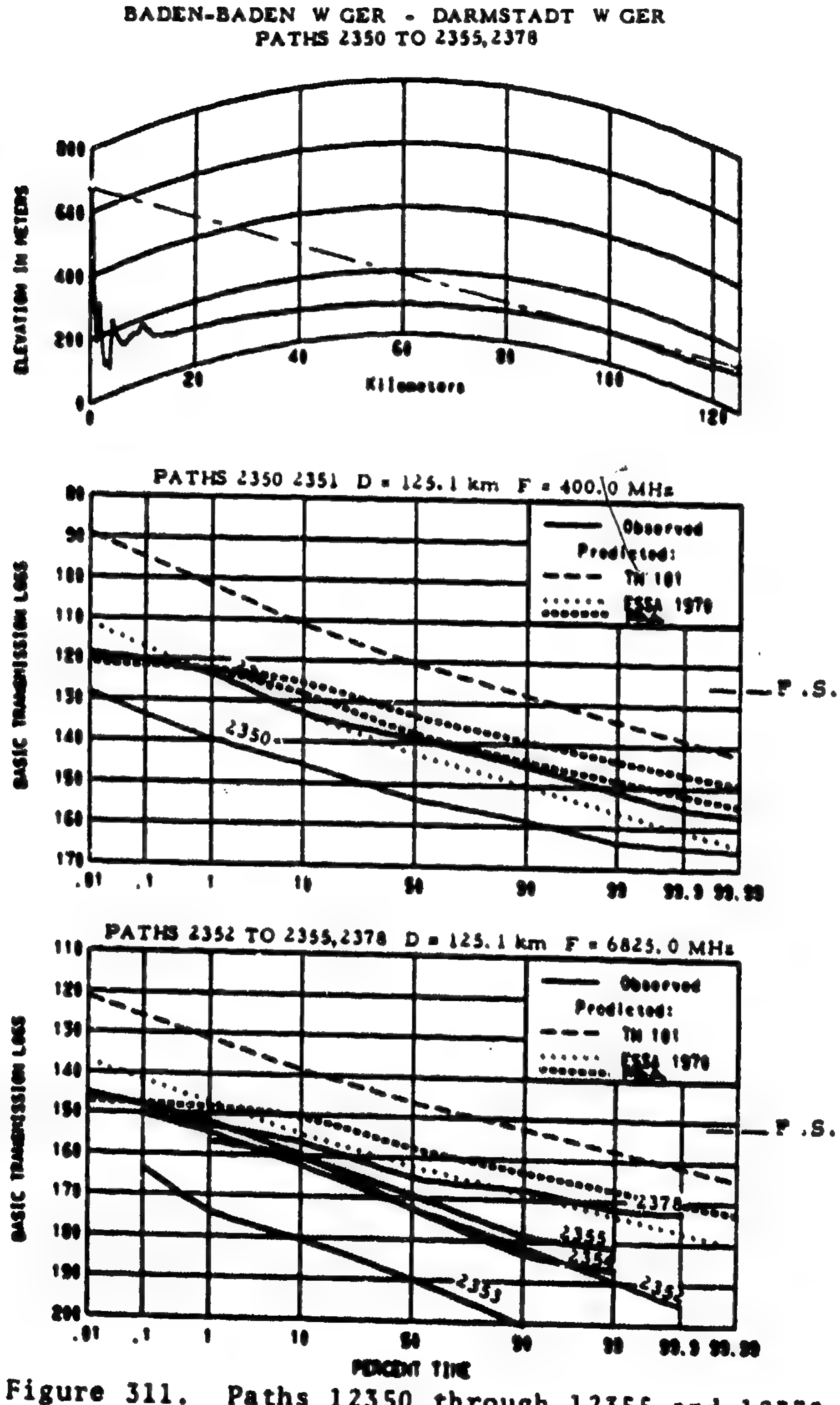


Figure 311. Paths 12350 through 12355 and 12378 profile and predictions.

Path Number: _ _ _ 1 2 3 5 0

Code Number: 1 1 2 4 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Baden Baden, West Germany - Darmstadt, West Germany*

Data type *6772 hourly medians*, Distance *125.1* km, h_{rs} *90* m-msl

N_s *291* N-units, a *8342* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *400* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	677	147
gain [dBi], main beam		
height [m], above site surface		21
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	48°45'51.2"N	49°51'54"N
longitude	8°16'51.5"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.35

Figure 312. Path 12350, parameters.

Path Number: _ _ _ 1 2 3 5 1

Code Number: 1 1 2 4 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Baden Baden, West Germany - Darmstadt, West Germany*

Data type *7042 hourly medians*, Distance *125.1* km, h_{rs} *90* m-msl

N_s *291* N-units, a *8342* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *400* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	677	167.5
gain [dBi], main beam		
height [m], above site surface		41.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	48°45'51.2"N	49°51'54"N
longitude	8°16'51.5"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.35

Figure 313. Path 12351, parameters.

Path Number: _ _ _ 1 2 3 5 2

Code Number: 1 1 3 6 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Baden Baden, West Germany - Darmstadt, West Germany*

Data type *8623 hourly medians*, Distance *125.1* km, h_{rs} *90* m-msl

N_s *291* N-units, a *8342* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *6825* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	699	167.5
gain [dBi], main beam		
height [m], above site surface		41.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	48°45'51.2"N	49°51'54"N
longitude	8°16'51.5"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.35

Figure 314. Path 12352, parameters.

Path Number: _ _ _ 1 2 3 5 3

Code Number: 1 1 3 6 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Baden Baden, West Germany - Darmstadt, West Germany*

Data type *3880 hourly medians*, Distance 125.1 km, h_{rs} 90 m-msl

N_s 291 N-units, a 8342 km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency 6825 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 0 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	699	147
gain [dBi], main beam		
height [m], above site surface		21
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	48°45'51.2"N	49°51'54"N
longitude	8°16'51.5"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.35

Figure 315. Path 12353, parameters.

Path Number: _ _ _ 1 2 3 5 4

Code Number: 1 1 3 6 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Baden Baden, West Germany - Darmstadt, West Germany*

Data type *4897 hourly medians*, Distance *125.1* km, h_{rs} *90* m-msl

N_s *291* N-units, a *8342* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *6825* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	699	154
gain [dBi], main beam		
height [m], above site surface		28
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	48°45'51.2"N	49°51'54"N
longitude	8°16'51.5"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.35

Figure 316. Path 12354, parameters.

Path Number: _ _ _ 1 2 3 5 5

Code Number: 1 1 3 6 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Baden Baden, West Germany - Darmstadt, West Germany*

Data type *6932 hourly medians*, Distance *125.1* km, h_{rs} *90* m-msl

N_s *291* N-units, a *8342* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *6825* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	699	167
gain [dBi], main beam		
height [m], above site surface		41
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	48°45'51.2"N	49°51'54"N
longitude	8°16'51.5"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.35

Figure 317. Path 12355, parameters.

Path Number: _ _ _ 1 2 3 7 8

Code Number: 1 1 3 6 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Baden Baden, West Germany - Darmstadt, West Germany*

Data type *1317 hourly medians*, Distance *125.1* km, h_{rs} *90* m-msl

N_s *291* N-units, a *8342* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *6825* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	699	167.5
gain [dBi], main beam		
height [m], above site surface		41.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	$48^{0}45'51.2''N$	$49^{0}51'54''N$
longitude	$8^{0}16'51.5''E$	$8^{0}37'33''E$
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.35

Figure 318. Path 12378, parameters.

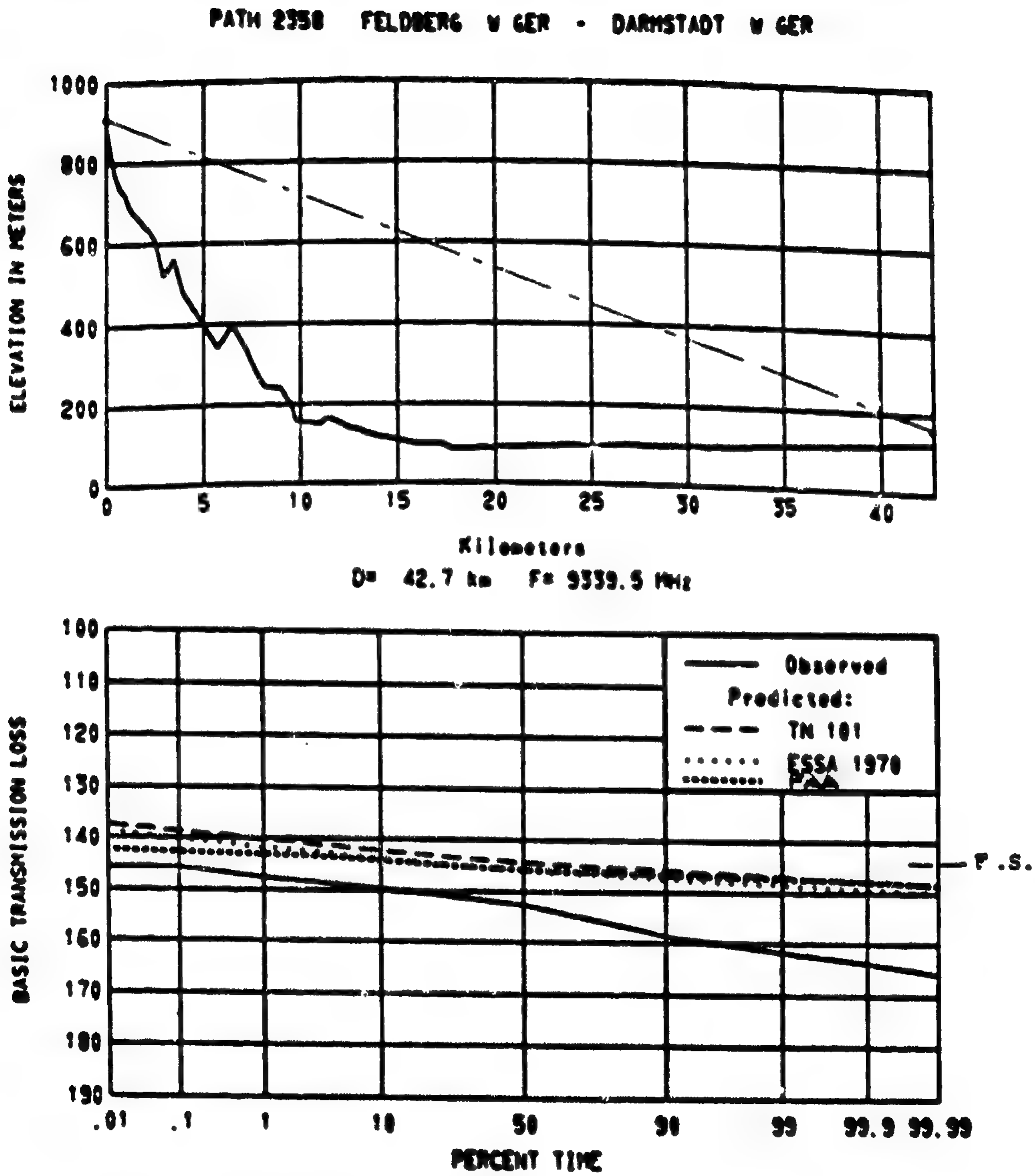


Figure 319. Path 12358, profile and predictions.

Path Number: _ _ _ 1 2 3 5 8

Code Number: 1 1 3 9 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Feldberg, West Germany - Darmstadt, West Germany*

Data type *14360 hourly medians*, Distance *42.7* km, h_{rs} *100* m-msl

N_s *296* N-units, a *8416* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *9339.5* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *419.9* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	910	159
gain [dBi], main beam		
height [m], above site surface		33
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		42.7
elevation [m-msl]		880.
elevation angle [deg]		
Location, latitude	50°13'59.2"N	49°51'54"N
longitude	8°27'32.7"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.31

Figure 320. Path 12358, parameters.

PATHS 2360 TO 2362 HOCHBLAUEN W GER - DARMSTADT W GER

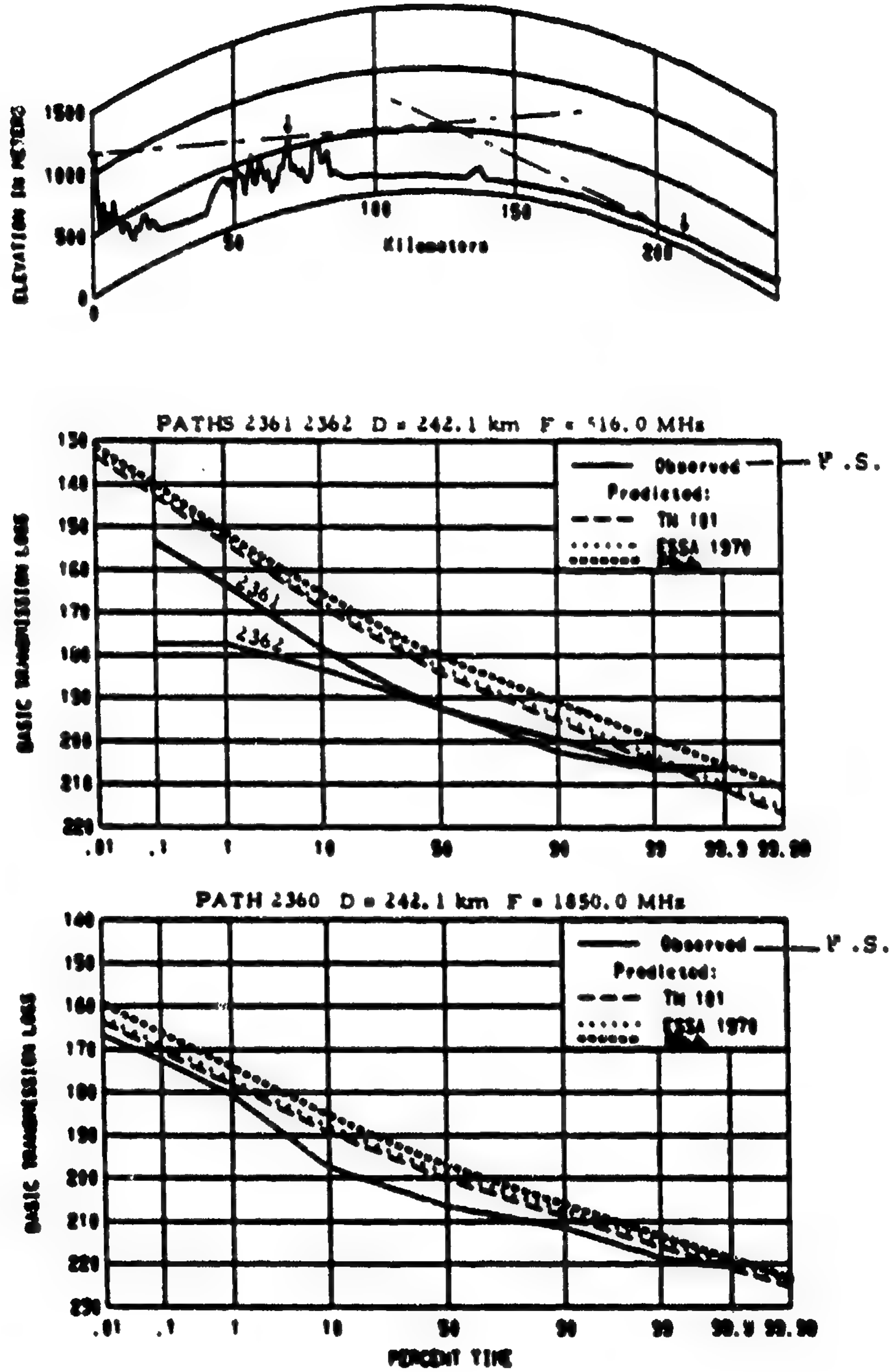


Figure 321. Paths 12360 through 12362, profile and predictions.

Path Number: _ _ _ 1 2 3 6 1

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 2 1 1

Location: *Hochblauen, West Germany - Darmstadt, West Germany*

Data type *4137 hourly medians*, Distance *242.1* km, h_{rs} *97* m-msl

N_s *294* N-units, a *8386* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *516* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *193.9* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1165	164
gain [dBi], main beam		
height [m], above site surface		38
line loss [dB]		
polarization		
type	H	H
Horizon distance [km]		
elevation [m-msl]		32.72
elevation angle [deg]		97
Location, latitude		
longitude	47°46'19"N	49°51'54"N
Path bearing	7°42'06"E	8°37'33"E
elevation [m-msl]		
Other information:		

OT/TRER 16, fig. 3.167

Figure 322. Path 12361, parameters.

Path Number: _ _ _ 1 2 3 6 2

Code Number: 1 1 2 5 3 0 0 4 5 2 1 1 3 2 1 1

Location: *Hochblauen, West Germany - Darmstadt, West Germany*

Data type *504 hourly medians*, Distance *242.1* km, h_{rs} *97* m-msl

N_s *294* N-units, a *8386* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *516* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *193.9* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1165	160
gain [dBi], main beam		
height [m], above site surface		34
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		32.72
elevation [m-msl]		97
elevation angle [deg]		
Location, latitude	47°46'19"N	49°51'54"N
longitude	7°42'06"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.167

Figure 323. Path 12362, parameters.

Path Number: _ _ _ 1 2 3 6 0

Code Number: 1 1 3 1 3 0 0 4 5 2 1 1 3 2 1 1

Location: *Hochblauen, West Germany - Darmstadt, West Germany*

Data type *6247 hourly medians*, Distance *242.1* km, h_{rs} *97* m-msl

N_s *294* N-units, a *8386* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *1850* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *193.9* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1165	166.5
gain [dBi], main beam		
height [m], above site surface		40.5
line loss [dB]		
polarization	V	V
type		
Horizon distance [km]		32.72
elevation [m-msl]		97.
elevation angle [deg]		
Location, latitude	47°46'19"N	49°51'54"N
longitude	7°42'06"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.167

Figure 324. Path 12360, parameters.

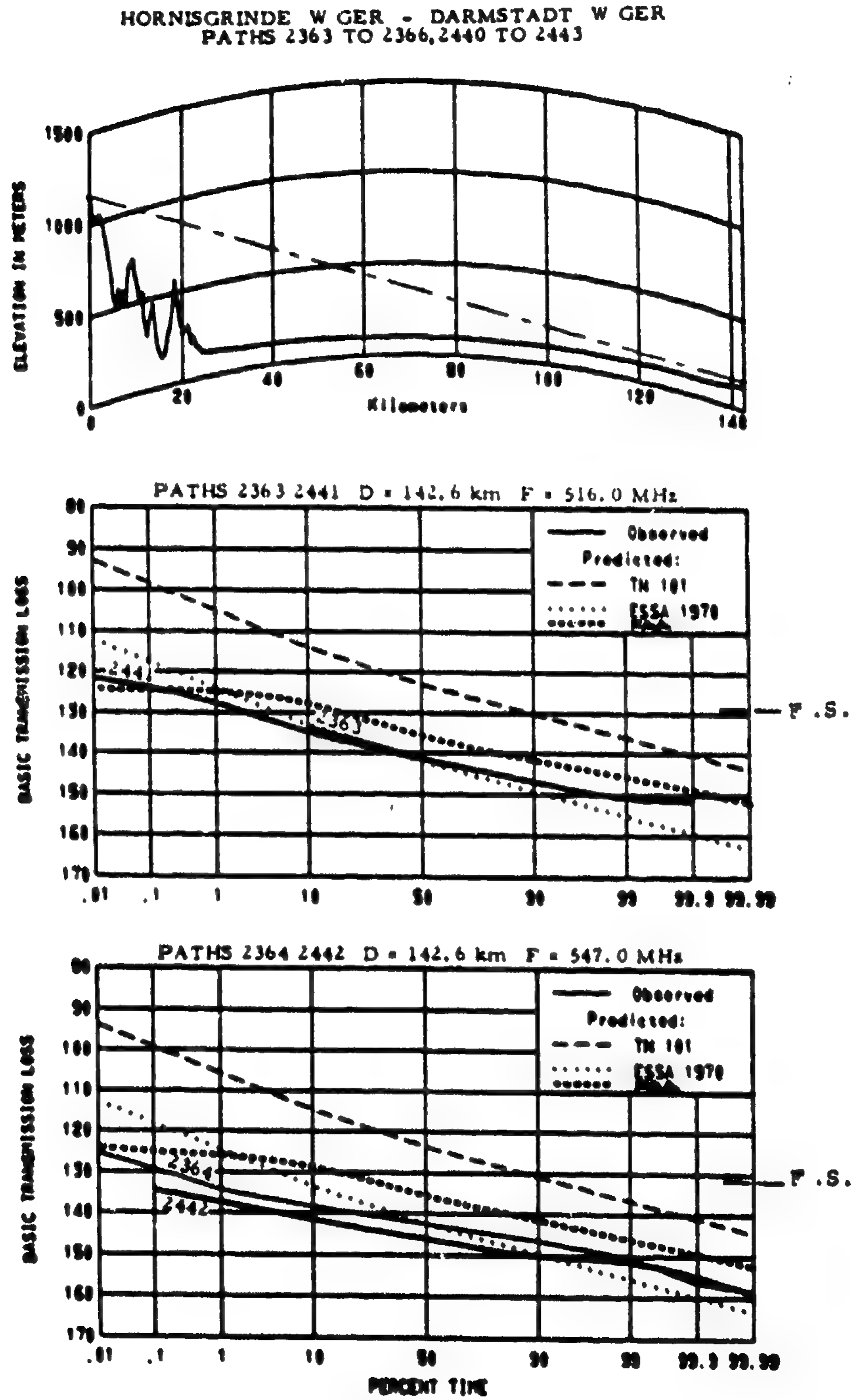


Figure 325. Paths 12363, 12441, 12364, and 12442, profile and predictions.

Path Number: _ _ _ 1 2 3 6 3

Code Number: 1 1 2 5 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Hornisgrinde, West Germany - Darmstadt, West Germany*

Data type *2100 hourly medians*, Distance *142.6* km, h_{rs} *100* m-msl

N_s *289* N-units, a *8314* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *516* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *289.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1150	163.5
gain [dBi], main beam		
height [m], above site surface		37.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	.	142.6
elevation [m-msl]		1135.
elevation angle [deg]		
Location, latitude	48°36'49.4"N	49°51'54"N
longitude	8°12'12.1"E	8°37'33"E
Path bearing		
elevation [m-msl]		
Other information:		

OT/TRER 16, fig. 1.36

Figure 326. Path 12363, parameters.

Path Number: _ _ _ 1 2 4 4 1

Code Number: 1 1 2 5 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Hornisgrinde, West Germany - Darmstadt, West Germany*

Data type *4855 hourly medians*, Distance *142.6* km, h_{rs} *100* m-msl

N_s *239* N-units, a *8314* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *516* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *289.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1150	170
gain [dBi], main beam		
height [m], above site surface		44
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		142.6
elevation [m-msl]		1135.
elevation angle [deg]		
Location, latitude	48°36'40.4"N	49°51'54"N
longitude	8°12'12.2"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.36

Figure 327. Path 12441, parameters.

Path Number: _ _ _ 1 2 3 6 4

Code Number: 1 1 2 5 1 0 0 4 5 2 1 1 3 2 1 1

Location: Hornisgrinde, West Germany - Darmstadt, West Germany

Data type 6087 hourly medians, Distance 142.6 km, h_{rs} 100 m-msl

N_s 289 N-units, a 8314 km, Surface type average ground

Climate continental temperate, de ______ km

Frequency 547 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 289.1 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1153	162
gain [dBi], main beam		
height [m], above site surface		36
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		142.6
elevation [m-msl]		1135.
elevation angle [deg]		
Location, latitude	48°36'49.4"N	49°51'54"N
longitude	8°12'12.2"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TPER 16, fig. 1.36

Figure 328. Path 12364, parameters.

Path Number: _ _ _ 1 2 4 4 2

Code Number: 1 1 2 5 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Hornisgrinde, West Germany - Darmstadt, West Germany*

Data type *8318 hourly medians*, Distance *142.6* km, h_{rs} *100* m-msl

N_s *289* N-units, a *8314* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *547* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *289.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1153	163.5
gain [dBi], main beam		
height [m], above site surface		37.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		142.6
elevation [m-msl]		1135.
elevation angle [deg]		
Location, latitude	48°36'49.4"N	49°51'54"N
longitude	8°12'12.2"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.36

Figure 329. Path 12442, parameters.

HORNISGRINDE W GER - DARMSTADT W GER

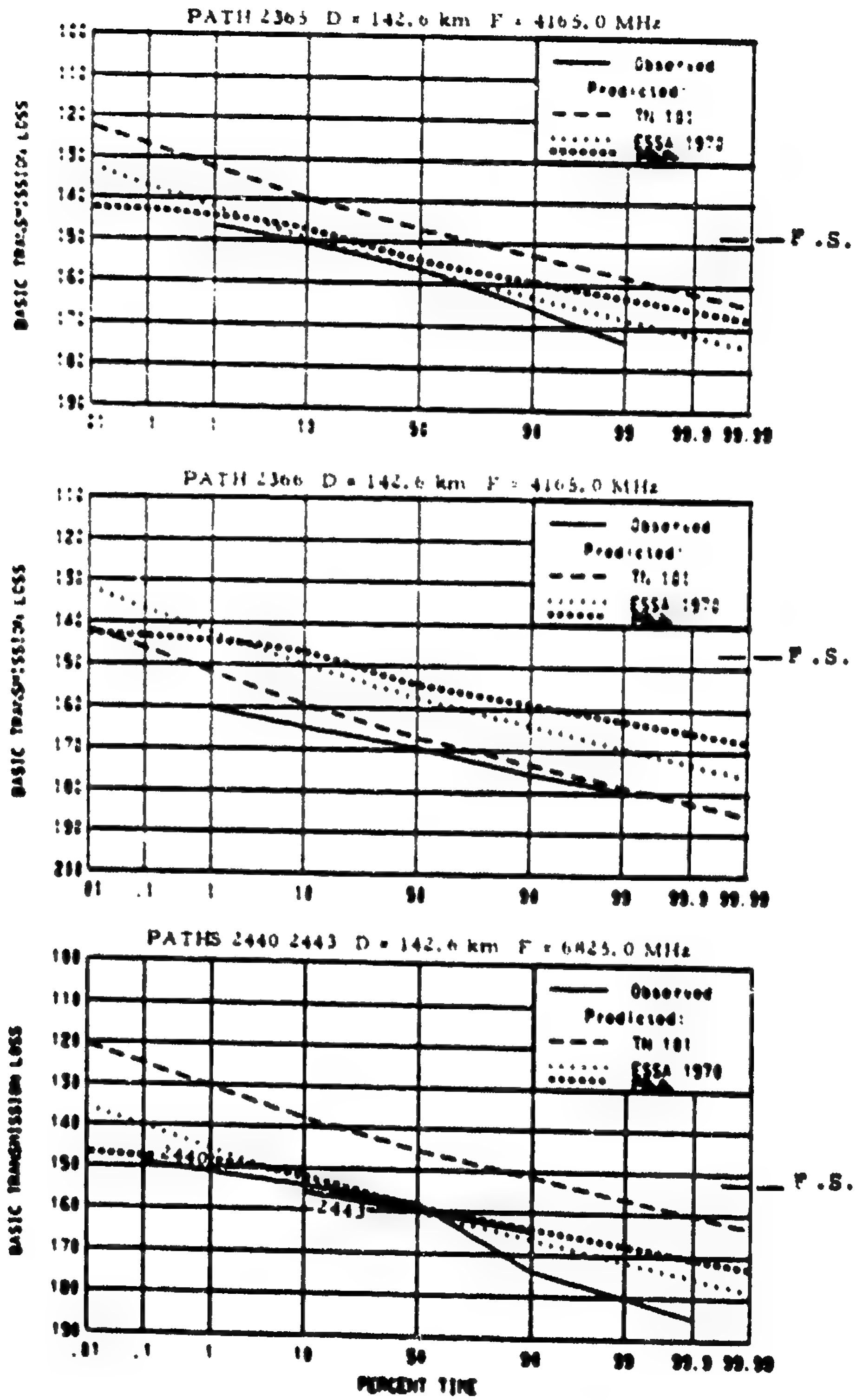


Figure 330. Paths 12365, 12366, 12440, and 12443, predictions. (see Figure 325 for profile)

Path Number: _ _ _ 1 2 3 6 5

Code Number: 1 1 3 4 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Hornisgrinde, West Germany - Darmstadt, West Germany*

Data type *9986 hourly medians*, Distance *142.6* km, h_{rs} *100* m-msl

N_s *289* N-units, a *8314* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *4165* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *289.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1155	163
gain [dBi], main beam		
height [m], above site surface		37
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		142.6
elevation [m-msl]		1135.
elevation angle [deg]		
Location, latitude	48°36'49.4"N	49°51'54"N
longitude	8°12'12.2"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.37

Figure 331. Path 12365, parameters.

Path Number: _ _ _ 1 2 3 6 6

Code Number: 1 1 3 4 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Hornisgrinde, West Germany - Darmstadt, West Germany*

Data type *13978 hourly medians*, Distance *142.6* km, h_{rs} *100* m-msl

N_s *289* N-units, a *8314* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *4165* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *289.1* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1154	147.5
gain [dBi], main beam		
height [m], above site surface		21.5
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		142.6
elevation [m-msl]		1135
elevation angle [deg]		
Location, latitude	48°36'49.4"N	49°51'54"N
longitude	8°12'12.2"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.37

Figure 332. Path 12366, parameters.

Path Number: _ _ _ 1 2 4 4 0

Code Number: 1 1 3 6 1 0 0 4 5 2 1 1 3 2 1 1

Location: Hornisgrinde, West Germany - Darmstadt, West Germany

Data type 4276 hourly medians, Distance 142.6 km, h_{rs} 100 m-msl

N_s 289 N-units, a 8314 km, Surface type average ground

Climate continental temperate, de ______ km

Frequency 6825 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 289.1 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1152	165
gain [dBi], main beam		
height [m], above site surface		39
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		142.6
elevation [m-msl]		1135
elevation angle [deg]		
Location, latitude	48°36'49.4"N	49°51'54"N
longitude	8°12'12.2"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.37

Figure 333. Path 12440, parameters.

Path Number: _ _ _ 1 2 4 4 3

Code Number: 1 1 3 6 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Hornisgrinde, West Germany - Darmstadt, West Germany*

Data type *hourly medians*, Distance *142.6* km, h_{rs} *100* m-msl

N_s *289* N-units, a *8314* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *6825* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *289.1* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1150	165
gain [dBi], main beam		
height [m], above site surface		39
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		142.6
elevation [m-msl]		1135
elevation angle [deg]		
Location, latitude	48°36'49.4"N	49°51'54"N
longitude	8°12'12.2"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.37

Figure 334. Path 12443, parameters.

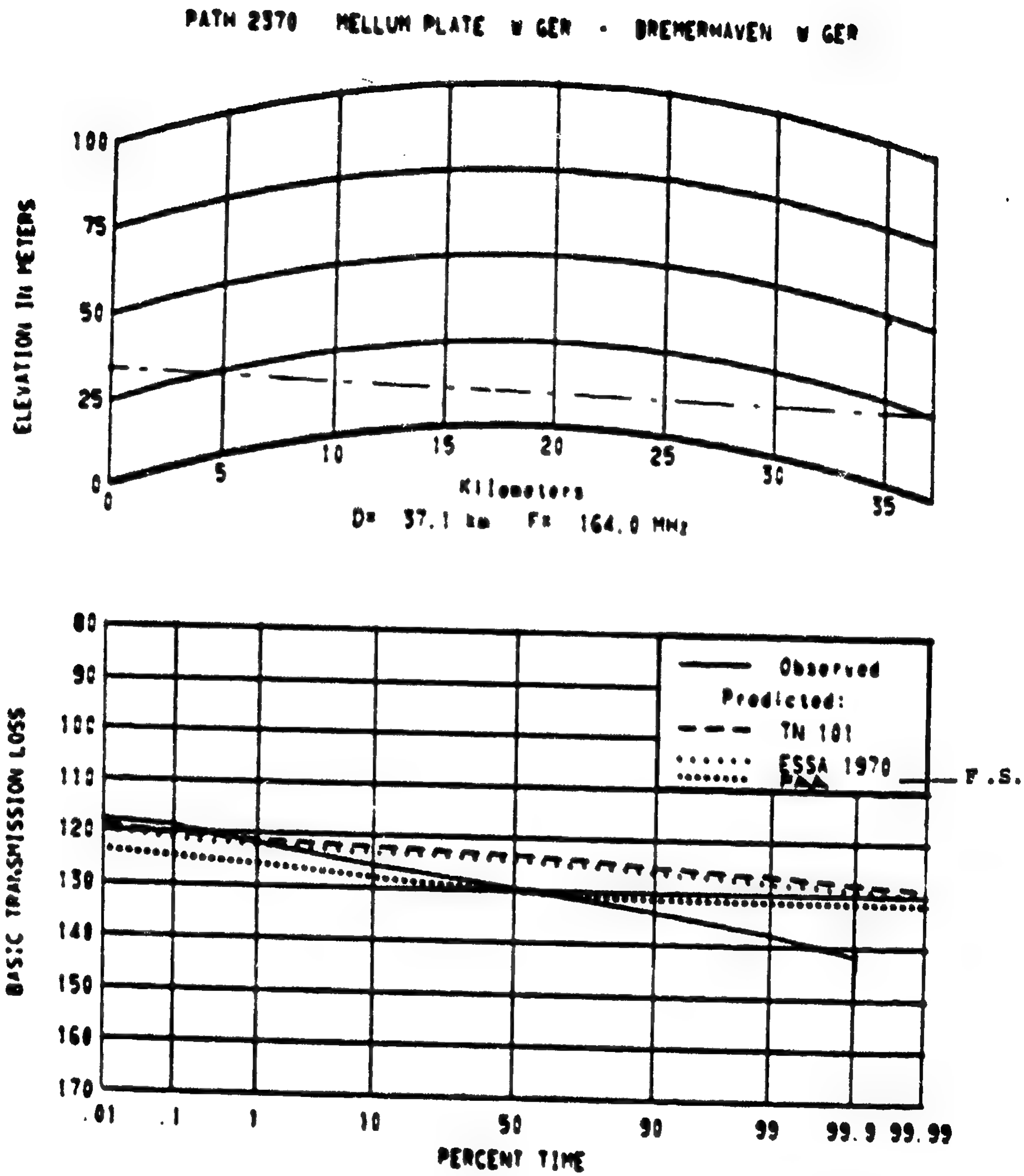


Figure 335. Path 12370, profile and predictions.

Path Number: _ _ _ 1 2 3 7 0

Code Number: 1 1 2 1 1 0 0 4 5 3 1 1 3 2 1 1

Location: *Mellum Plate, West Germany - Bremerhaven, West Germany*

Data type *11540 hourly medians*, Distance *37.1* km, h_{rs} *0* m-msl

N_s *312* N-units, a *8676* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *164* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	34.5	25.1
gain [dBi], main beam		
height [m], above site surface		24.7
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	53°46'15"N	53°34'20"N
longitude	8°06'E	8°33'E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.30

Figure 336. Path 12370, parameters.

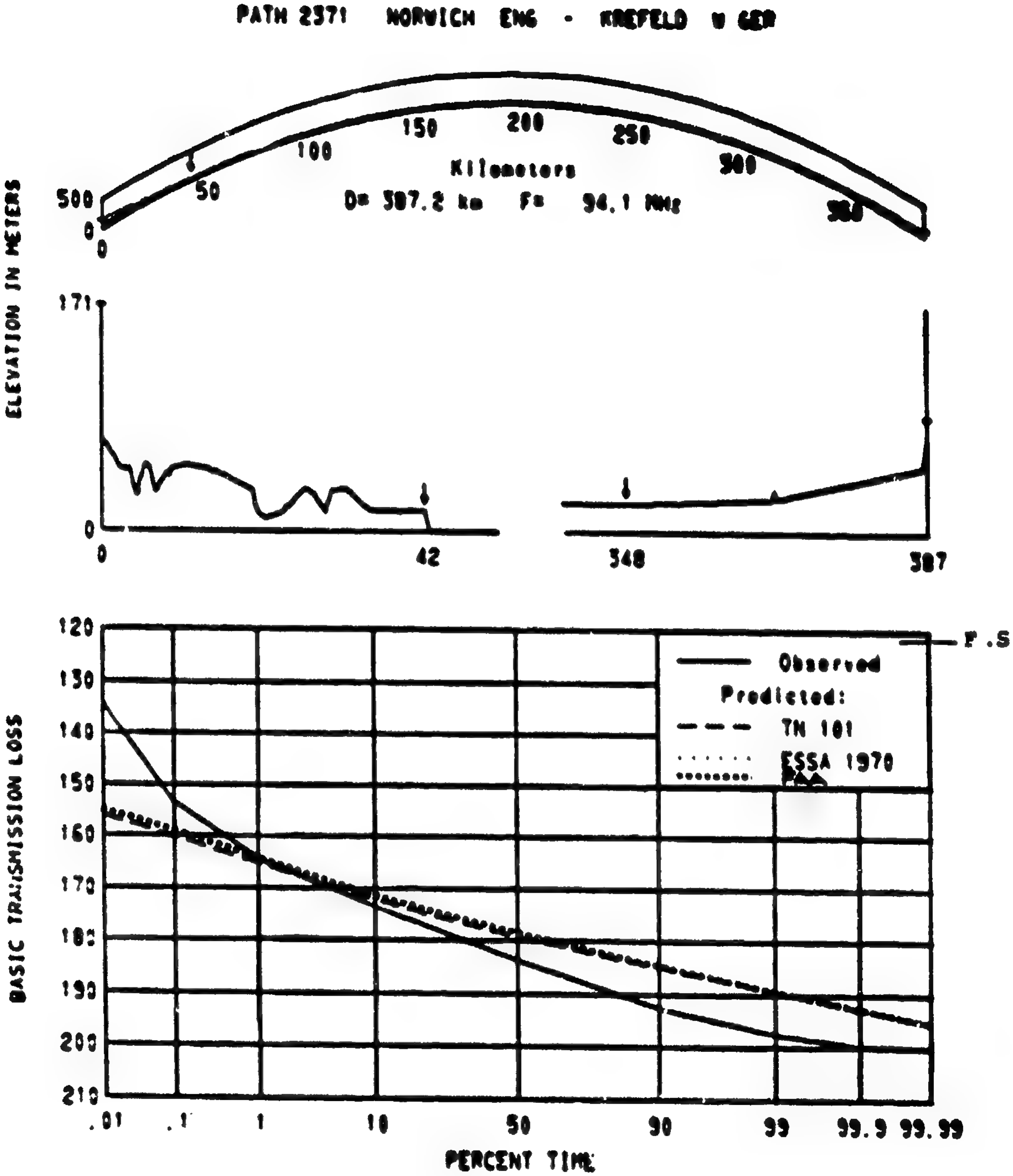


Figure 337. Path 12371, profile and predictions.

Path Number: _ _ _ 1 2 3 7 1

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 3 4 1 1

Location: *Norwich, England - Krefeld, West Germany*

Data type *14377 hourly medians*, Distance *387.2* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *94.1* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *28.8* m, θ ______ mr.

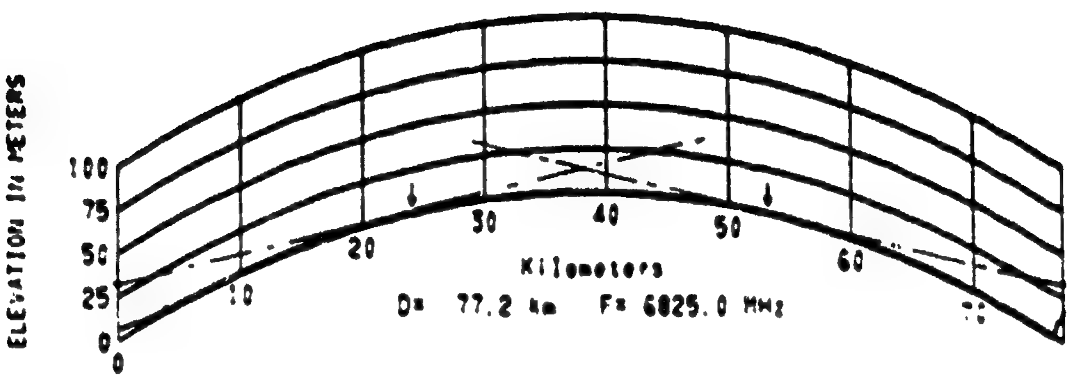
	Transmitter	Receiver
Antenna elevation [m-msl]	171	88.7
gain [dBi], main beam		
height [m], above site surface		19
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		38.9
elevation [m-msl]		21
elevation angle [deg]		
Location, latitude	52°31'03"N	51°25'20"N
longitude	1°08'E	6°28'39"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.159

Figure 338. Path 12371, parameters.

PATHS 2372 2383 WEDDEWARDEN W GER - HELGOLAND W GER



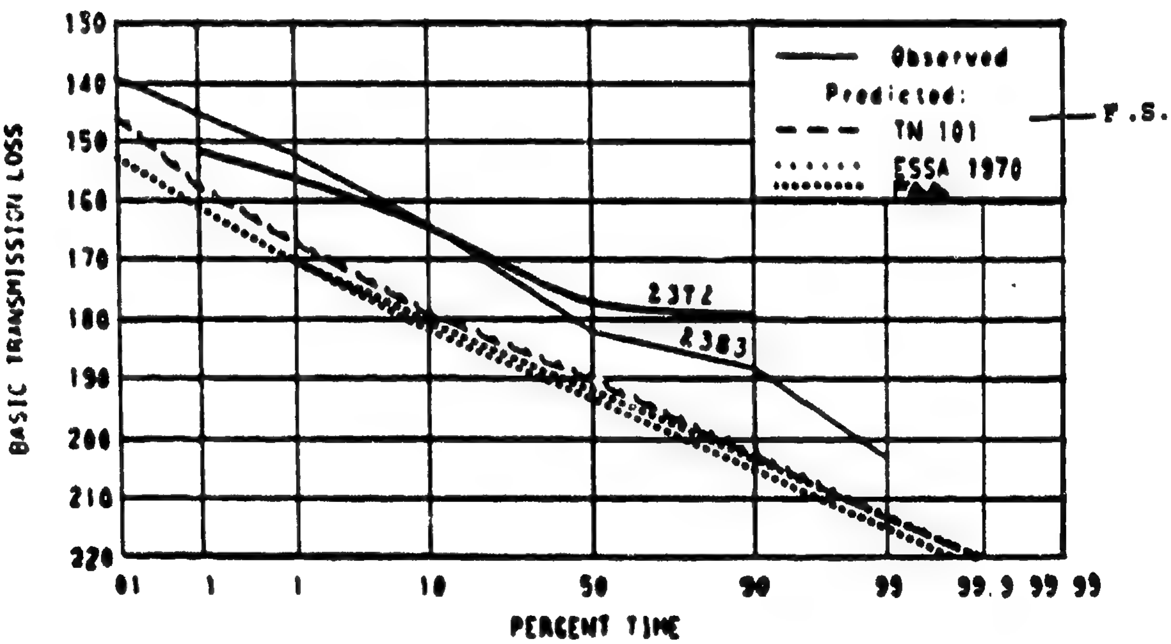


Figure 339. Paths 12372 and 12383, profile and predictions.

Path Number: _ _ _ 1 2 3 7 2

Code Number: 1 1 3 6 3 0 0 4 5 3 1 1 3 2 1 1

Location: *Weddewarden, West Germany - Helgoland, West Germany*

Data type *976 hourly medians*, Distance *77.2* km, h_{rs} *0* m-msl

N_s *314* N-units, a *8711* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *6825* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	28	30
gain [dBi], main beam		
height [m], above site surface	22.6	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	53°36'06"N	54°10'47"N
longitude	8°32'06"E	7°53'16"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.162

Figure 340. Path 12372, parameters.

Path Number: _ _ _ 1 2 3 8 3

Code Number: 1 1 3 6 3 0 0 4 5 3 1 1 3 2 1 1

Location: *Weddewarden, West Germany - Helgoland, West Germany*

Data type *21165 hourly medians*, Distance *77.2* km, h_{rs} *0* m-msl

N_s *314* N-units, a *8711* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *6825* MHz, Transmitter output ______ dBW, EIRP ______ dBW

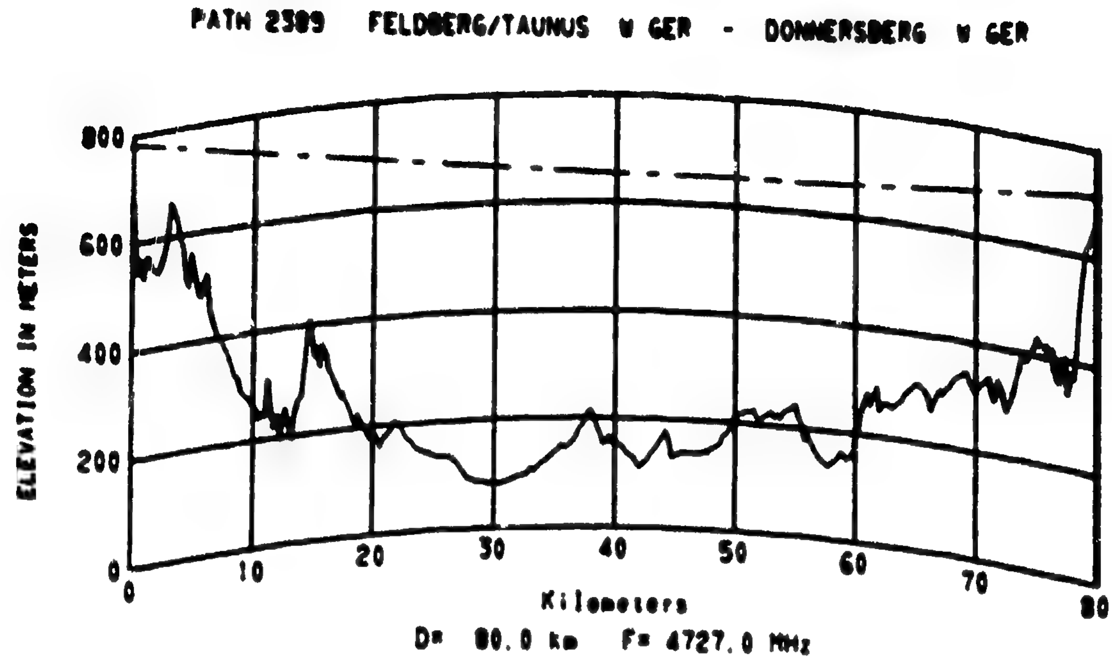
Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	33	33
gain [dBi], main beam		
height [m], above site surface		16
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	53°36'06"N	54°10'47"N
longitude	8°32'06"E	7°53'16"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.162

Figure 341. Path 12383, parameters.



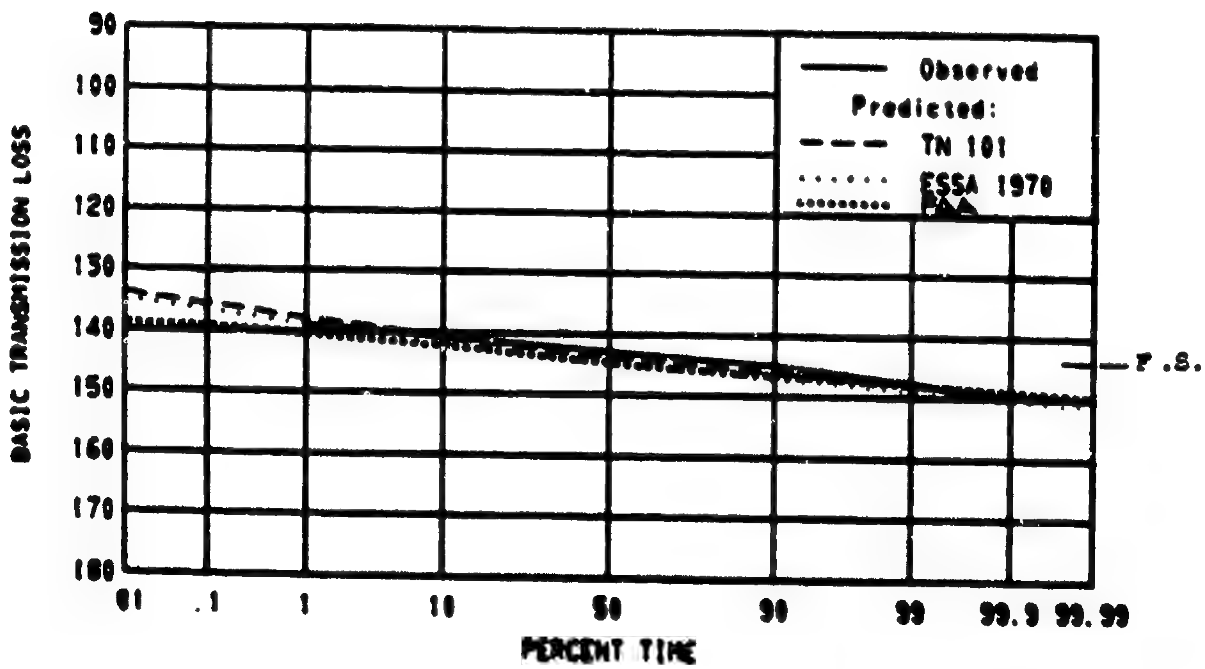


Figure 342. Path 12339, profile and predictions.

Path Number: _ _ _ 1 2 3 8 9

Code Number: 1 1 3 4 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Feldberg/Taunus, West Germany - Donnersberg, West Germany*

Data type *798 hourly medians*, Distance *80.0* km, h_{rs} *250* m-msl

N_s *290* N-units, a *8328* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *4727* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *419.7* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	781	715
gain [dBi], main beam		
height [m], above site surface		29
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		76.7
elevation [m-msl]		663
elevation angle [deg]		
Location, latitude	50°14'32"N	49°37'31"N
longitude	8°29'47"E	7°55'11"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.34

Figure 343. Path 12389, parameters.

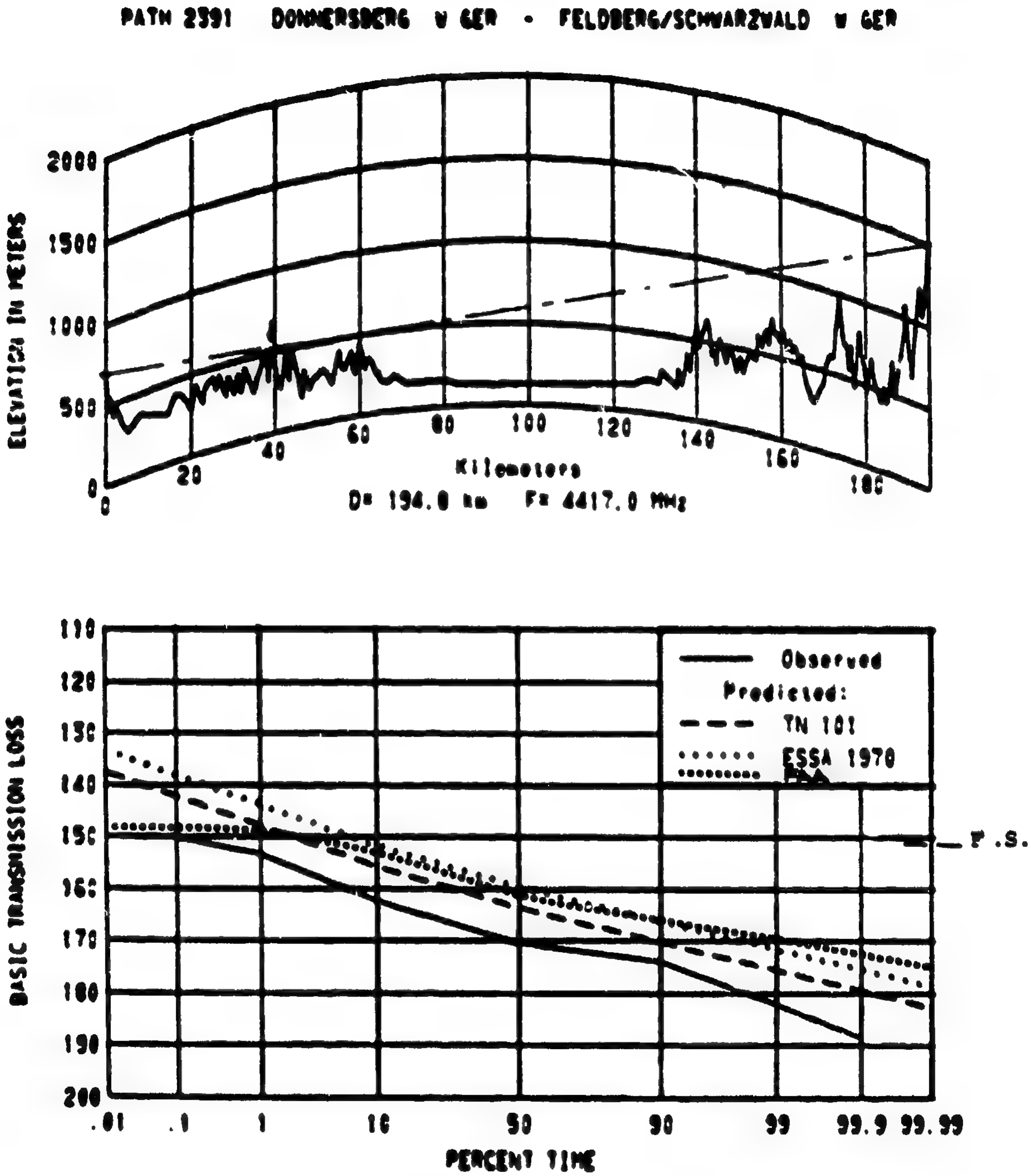


Figure 344. Path 12391, profile and predictions.

Path Number: _ _ _ 1 2 3 9 1

Code Number: 1 1 3 4 2 2 0 4 5 2 1 1 3 2 1 1

Location: *Donnersberg, West Germany - Feldberg/Schwarzwald, West Germany*

Data type *1264 hourly medians*, Distance *194.8* km, h_{rs} *350* m-msl

N_s *330* N-units, a *9021* km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency *4417* MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh *426.9* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	695.7	1504
gain [dBi], main beam		
height [m], above site surface	10.7	
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]	39.17	
elevation [m-msl]	530	
elevation angle [deg]		
Location, latitude	49°37'31"N	47°52'25"N
longitude	7°55'11"E	8°00'23"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 2.36

Figure 345. Path 12391, parameters.

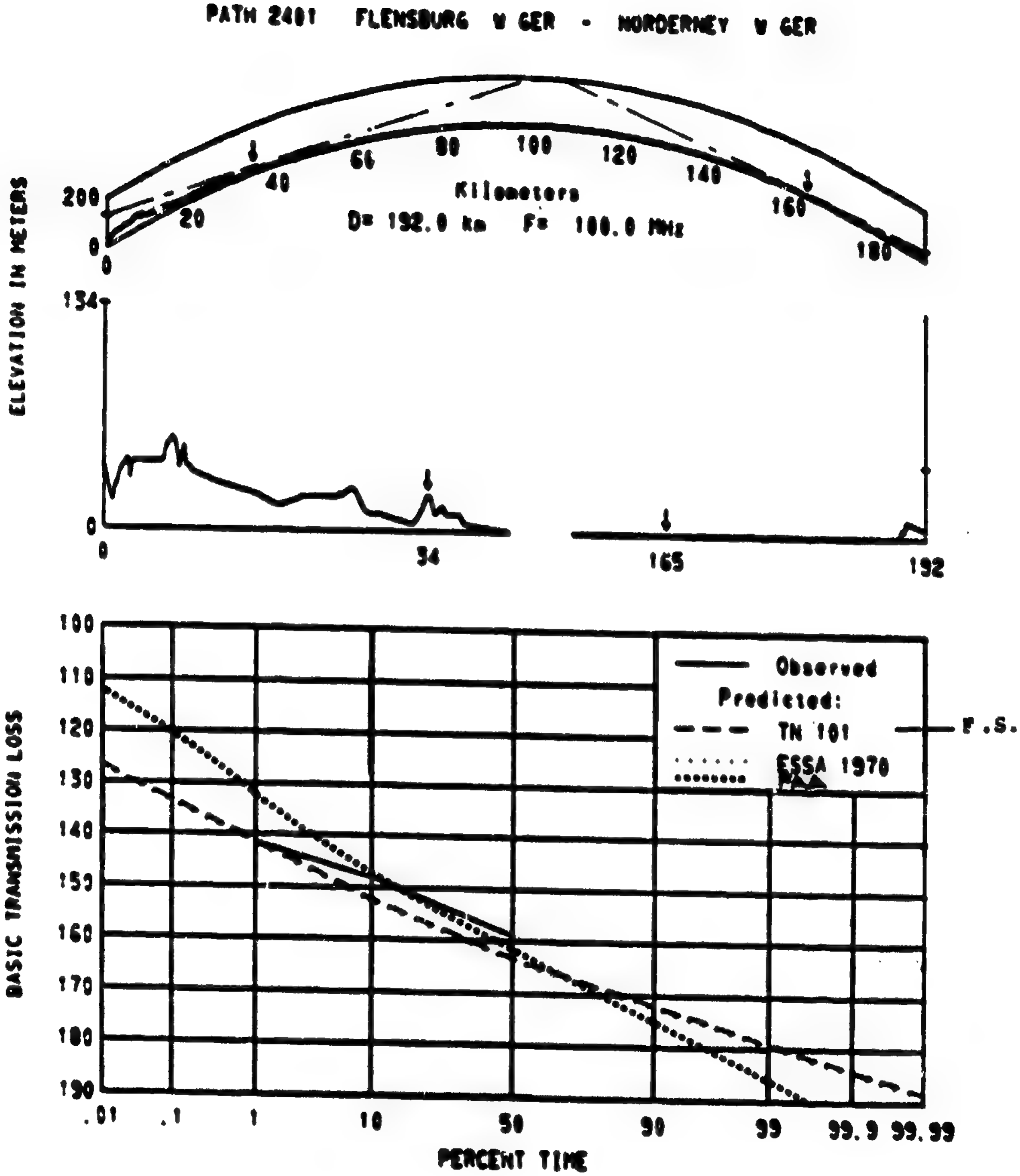


Figure 346. Path 12401, profile and predictions.

Path Number: _ _ _ 1 2 4 0 1

Code Number: 1 1 2 1 3 0 0 4 5 3 1 1 3 2 1 1

Location: *Flensburg, West Germany - Norderney, West Germany*

Data type *1437 hourly medians*, Distance *192.0* km, h_{rs} *0* m-msl

N_s *313* N-units, a *8694* km, Surface type *sea water*

Climate *maritime temperate oversea*, de ______ km

Frequency *100* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *0* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	134	43
gain [dBi], main beam		
height [m], above site surface		38
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	54°47'28"N	53°42'36"N
longitude	9°27'11"E	7°09'37"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.163

Figure 347. Path 12401, parameters.

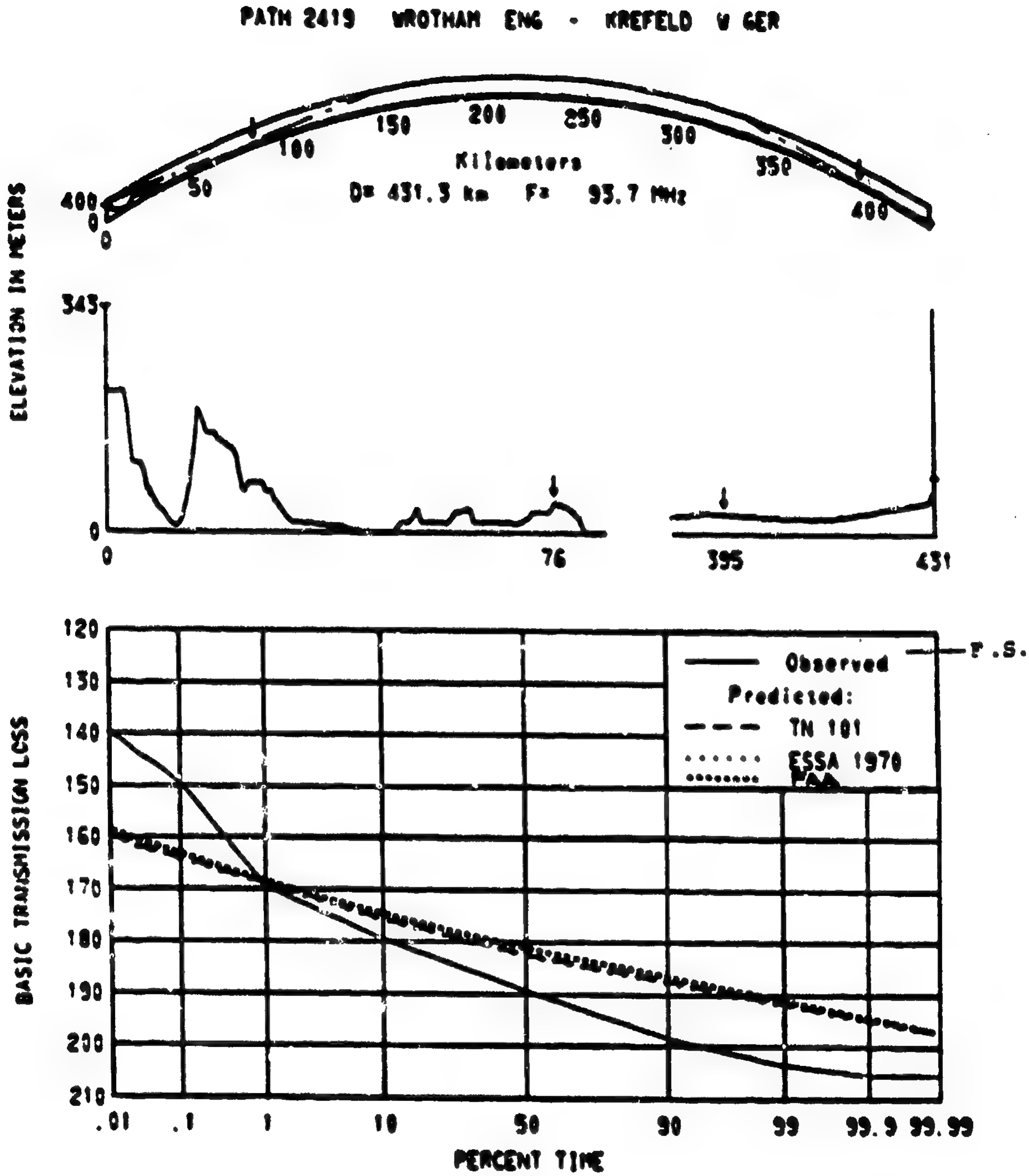


Figure 348. Path 12419, profile and predictions.

Path Number: ___ ___ ___ 1 2 4 1 9

Code Number: 1 1 2 0 3 0 0 4 5 2 1 1 3 4 1 1

Location: *Wrotham, England - Krefeld, West Germany*

Data type *7103 hourly medians*, Distance *431.3* km, h_{rs} *0* m-msl

N_s *317* N-units, a *8766* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *93.7* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *39.1* m, θ ______ mr.

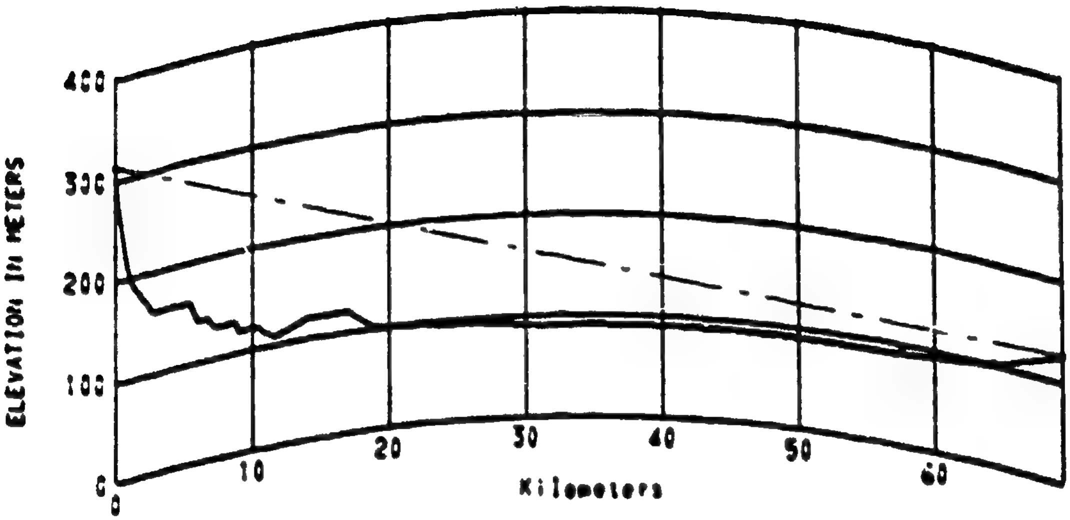
	Transmitter	Receiver
Antenna elevation [m-msl]	343.2	88
gain [dBi], main beam		
height [m], above site surface		18.3
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		35.9
elevation [m-msl]		30
elevation angle [deg]		
Location, latitude	51°19'11"N	51°25'20"N
longitude	0°17'20"E	6°28'39"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 3.160

Figure 349. Path 12419, parameters.

PATHS 2444 TO 2446 HAMBACH W GER - DARMSTADT W GER



PATH 2444 D = 69.3 km F = 2492.7 MHz

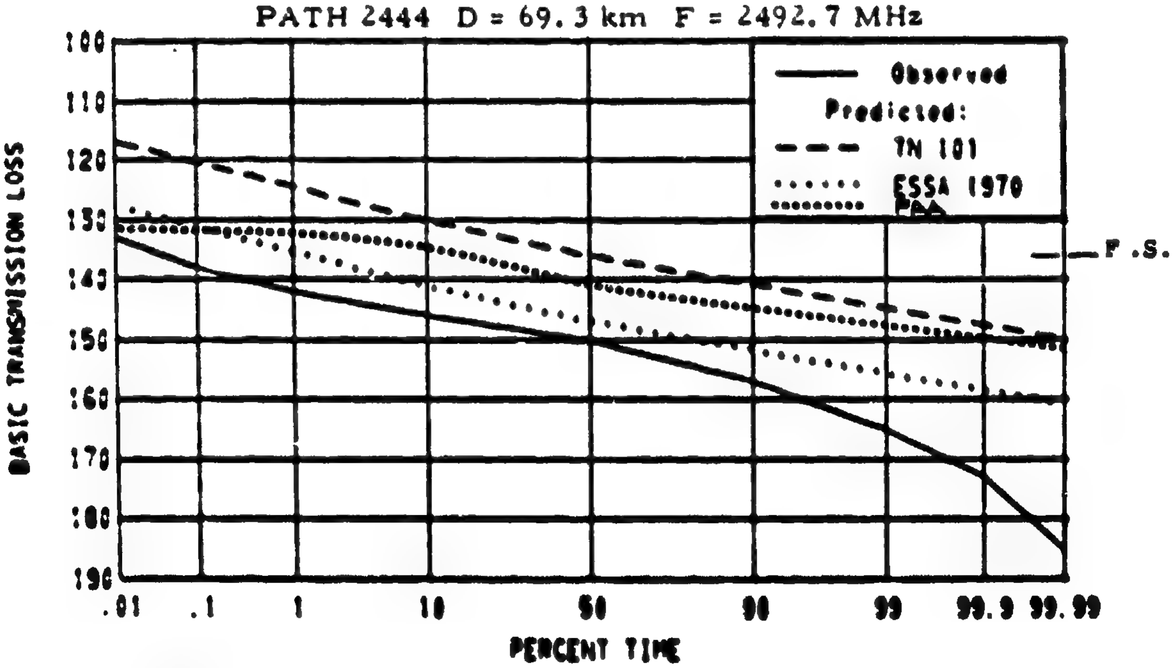


Figure 350. Path 12444, profile and predictions.

Path Number: _ _ _ 1 2 4 4 4

Code Number: 1 1 3 2 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Hambach, West Germany - Darmstadt, West Germany*

Data type *30240 hourly medians*, Distance 69.3 km, h_{rs} 95 m-msl

N_s 305 N-units, a 8557 km, Surface type *average ground*

Climate *continental temperate*, de ____ km

Frequency 2492.7 MHz, Transmitter output ____ dBW, EIRP ____ dBW

Δh 60.2 m, θ ____ mr.

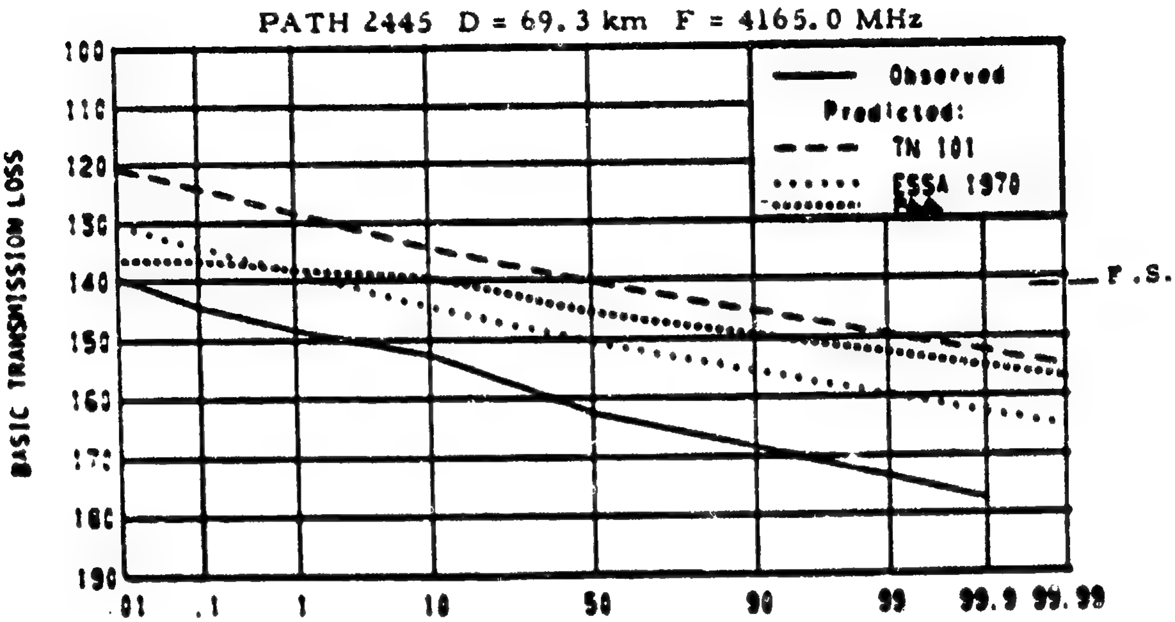
	Transmitter	Receiver
Antenna elevation [m-msl]	314	127
gain [dBi], main beam		
height [m], above site surface		1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		69.3
elevation [m-msl]		300
elevation angle [deg]		
Location, latitude	49°20'03"N	49°51'54"N
longitude	8°07'28"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.32

Figure 351. Path 12444, parameters.

HAMBACH W GER - DARMSTADT W GER



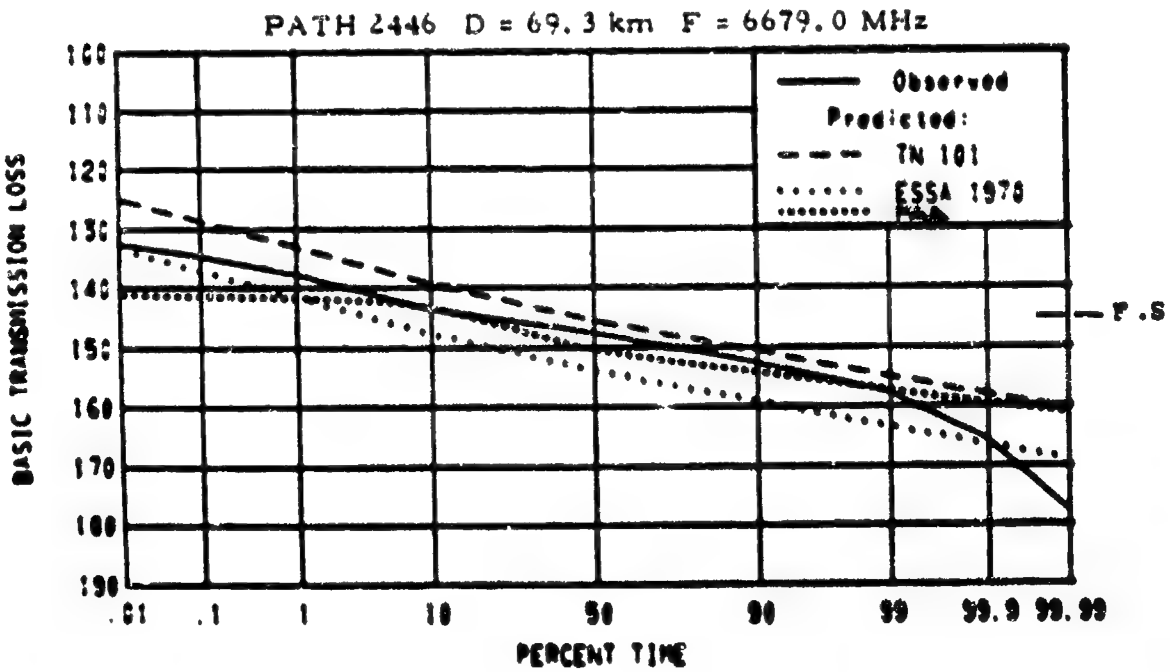


Figure 352. Paths 12445 and 12446, profile and predictions.

Path Number: _ _ _ 1 2 4 4 5

Code Number: 1 1 3 4 1 0 0 4 5 2 1 1 3 2 1 1

Location: Hambach, West Germany - Darmstadt, West Germany

Data type 21855 hourly medians, Distance 69.3 km, h_{rs} 95 m-msl

N_s 305 N-units, a 8557 km, Surface type average ground

Climate continental temperate, de ______ km

Frequency 4165 MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh 60.2 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	314	127
gain [dBi], main beam		
height [m], above site surface		1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		69.3
elevation [m-msl]		300
elevation angle [deg]		
Location, latitude	49°20'03"N	49°51'54"N
longitude	8°07'28"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, fig. 1.33

Figure 353. Path 12445, parameters.

Path Number: _ _ _ 1 2 4 4 6

Code Number: 1 1 3 6 1 0 0 4 5 2 1 1 3 2 1 1

Location: *Hambach, West Germany - Darmstadt, West Germany*

Data type *27714 hourly medians*, Distance *69.3* km, h_{rs} *95* m-msl

N_s *305* N-units, a *8557* km, Surface type *average ground*

Climate *continental temperate*, de ______ km

Frequency *6679* MHz, Transmitter output ______ dBW, EIRP ______ dBW

Δh *60.2* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	314	127
gain [dBi], main beam		
height [m], above site surface		1
line loss [dB]		
polarization	H	H
type		
Horizon distance [km]		69.3
elevation [m-msl]		300
elevation angle [deg]		
Location, latitude	49°20'03"N	49°51'54"N
longitude	8°07'28"E	8°37'33"E
Path bearing		
elevation [m-msl]		

Other information:

OT/TRER 16, *fig.* 1.33

Figure 354. Path 12446, parameters.

4.4 RSMS DATA

In this section predictions made with the IF-77 model and other propagation models of Table 2 (i.e., ESSA 1970, Egli, FCC, Free Space, Longley-Rice with estimated horizon parameters [24, p. 12], and Okumura) are compared with data collected during the summer of 1975 by the ITS Radio Spectrum Measurement System (RSMS). About 167 hours of data taken over six paths are involved (Table 1). The information provided here has not been formally published but is based on material used in an oral presentation titled "San Francisco RSMS propagation data - comparison with predictions," which was given by G. D. Gierhart at the Denver/Boulder Chapter IEEE/AP-S Symposium on May 7, 1976. Path parameters and profiles are shown in Figures 355 through 364 at the end of this section. They are grouped by path number, as shown in the List of Figures.

Table 8 provides received signal level statistics for these paths. Effective heights determined for use with various propagation models are given in Table 9. Table 10 provides the difference, ΔL, between median basic transmission levels predicted via the various models and those observed for all six paths. Here ΔL is calculated using median received power levels as shown in Table 3.

Statistics associated with ΔL for various model-height combinations are also given in Table 10, and some observations concerning these statistics are as follows:

(1) If reasonable effective heights are used, all models produce predictions with a ΔL of 10 dB or less.

(2) Every model-height combination results in at least one ΔL with a magnitude greater than 10 dB, but three combinations come within 3 dB of measurements made over the only nonline-of-sight path (30003, Fig. 360) in the group.

(3) Predictions made with the Okumura model always result in free space values, but ranking by $\overline{\Delta L}$

Table 8. Paths 30001 through 30006 Received Signal Level Statistics(d)

Path	Transmitter	Receiver	Frequency (MHz)	Number of Hourly Medians	Median Signal Levels (dBm) Hourly(b)	Median Signal Levels (dBm) Instantaneous(c)	Fading Range(a) (dB) Hourly(b)	Fading Range(a) (dB) Instantaneous(c)
30001	Tomita Hill	Palo Alto	162.4	41	-59	-59	4	5
30002	Tomita Hill	Bernal Hts.	162.4	19	-72	-73	6	6
30003	San Fran.	Palo Alto	162.55	21	-58	-59	10	11
30004	San Fran.	Bernal Hts.	162.55	(d)	-47	---	---	---
30005	Mt. Umunhum	Palo Alto	409	33	-93	-93	7	8
30006	Redwood City	Bernal Hts.	416.375	33	-69	-69	3	6

(a) Difference between signal level exceeded 10 percent of the time and that exceeded 90 percent of the time.

(b) Based on cumulative distributions of hourly medians.

(c) Based on cumulative distributions of instantaneous levels.

(d) Based on spot measurements, signal level exceeded the top (-53 dBm) of the RSMS calibration table during normal measurements. Special measurements with additional attenuation were made to obtain values for high signal levels.

Table 9. Paths 30001 through 30006 Effective Antenna Heights (Meters)

	30001	30002	30003	30004	30005	30006
			---Transmitter---			
GMF[a]	10.7	10.7	16.8	16.8	9.1	4.6
GROUND[b]	12.2	12.2	16.8	16.8	9.1	4.6
ESSA 70[c]	822	1013.6	24.7	566.2	805.7	4.6
EGLI[d]	722	739.7	481.7	500	722	---
FCC[d]	722	739.7	481.7	500	722	---
IF-77[e]	873	1018	16.8	578	873	4.6
LONGLEY-RICE[f]	21.9	21.5	26.2	25.9	18.9	13.6
			---Receiver---			
GROUND[a]	10.7	10.7	10.7	10.7	10.7	10.7
ESSA 70[b]	10.7	117.5	10.7	85.3	10.7	128.8
EGLI[g]	10.7	10.7	10.7	10.7	10.7	10.7
FCC[h]	10	10	10	10	10	10
IF-77[e]	10.7	157	40.5	103.1	10.7	154.3
LONGLEY-RICE[f]	20.4	20.1	20.3	20.1	20.4	17.8

(a) Height above site surface given in the Government Master File (GMF) of frequency assignments.

(b) Actual height above site surface as obtained from station operating personnel.

(c) Obtained by a statistical analysis of terrain data that is a part of the computer program used for the ESSA 1970 predictions (Telecommunications analysis services reference guide, an informal OT/ITS document).

(d) Height above average terrain that is along the profile 2 to 10 mi (3 to 16 km). An effective transmitting antenna height for path 30006 is not available since the antenna is below the average terrain (Fig. 364).

(e) Estimated from observation of path profiles.

(f) Estimated from the terrain parameter Δh using the siting option for maximum effective heights [24, p. 11].

(g) Taken as height above ground for the receiving antenna.

(h) Maximum receiving antenna height for which model curves are applicable.

Table 10. Paths 30001 through 30006 ΔL Statistics

Model[e]	Effective Heights[f]	$\Delta L^{(a)}$ (dB)						$\overline{\Delta L}^{(b)}$ (dB)	$\sigma_{\Delta L}^{(c)}$ (dB)	$\mathrm{MAX}\lvert\Delta L\rvert^{(d)}$ (dB)
		30001	30002	30003	30004	30005	30006			
IF-77-V[g]	FAA	14	-2	-3	-4	1	-10	-1	8	14
IF-77-L[g]	FAA	6	-4	-3	-5	1	-10	-2	5	-10
EGLI	FAA	10	-2	3	-5	1	7	2	6	10
ESSA 1970	ESSA 1970[h]	12	6	7	1	1	-2	4	5	12
ESSA 1970	FAA	12	6	9	1	1	-2	4	5	12
EGLI	EGLI	12	13	-15	7	2	(f)	4	11	-15
FCC	FCC	12	20	-19	6	8	(f)	5	15	20
OKUMURA	FCC	3	-2	-20	-5	-7	(f)	-6	9	20
ESSA 1970	EGLI	12	10	8	4	1	(f)	7	4	12
FREE SPACE	Not Used	3	-2	-20	-5	-7	-12	-7	8	-20
ESSA 1970	CRF	-5	-7	-13	4	-26	-2	-8	10	-26
LONGLEY-RICE	FAA	32	-2	13	-5	27	-2	10	16	32
LONGLEY-RICE	EGLI	34	24	4	13	30	-2	17	15	34
LONGLEY-RICE	LONGLEY-RICE	42	38	11	25	40	2	26	17	42
EGLI	GROUND	48	49	14	36	40	38	36	13	49

(a) Difference between predicted and observed median basic transmission loss (Table 3).

(b) Mean of ΔL.

(c) Sample standard deviation of ΔL.

(d) The ΔL value (sign included) corresponding to the maximum absolute value of ΔL encountered.

(e) Model-effective height combinations are ordered by their ability to provide good predictions for these paths with the "best" predictor listed first. Here, ordering is based on $\overline{\Delta L}$, $\sigma_{\Delta L}$, and MAX|ΔL|, respectively. No consideration is given to the values of other parameters once a difference large enough to establish a relative rank is obvious.

(f) See Table 9.

(g) Predictions were made via the IF-77 model for both the variability (-V) and lobing (-L) options (Table 4), [21, Sec. 4.1].

(h) Values of ΔL for path 30003 were used to rank this predictor with the one following it.

caused it to be rated above the Free Space model. The lower $\overline{\Delta L}$ was obtained because the height above average terrain problem (Table 9) prevented the use of the Okumura model for path 30006.

(4) Free Space is the simplest model to use and is a part of most other models. It just happens to provide reasonable estimates on the average for the mostly (5 of 6) line-of-sight paths considered in this section. But it can result in large errors for nonline-of-sight paths; e.g., ΔL for path 30003 is -20 dB.

(5) The poor performance of the Longley-Rice area mode model and the Egli model with heights above ground is not surprising since they are really not applicable to paths of this type (Table 2).

(6) The ESSA 1970 GMF predictions were performed using unaltered data from the Government Master File (GMF) of frequency assignments (except where the GMF frequency did not correspond to the frequency in use) and the master terrain data file. This means that both equipment and terrain parameters differ for this prediction set; e.g., antenna gain differences as much as 24 dB occurred. For other predictions, terrain information obtained from our master terrain data file was supplemented with data obtained from 7.5 minute topographic maps. Despite these handicaps, the ESSA 1970 GMF combination was not the worst performer, and the magnitude of $\overline{\Delta L}$ was only 8 dB. However, the Free Space model was ranked above it so that the use of accurate equipment parameters is an important part of the prediction process.

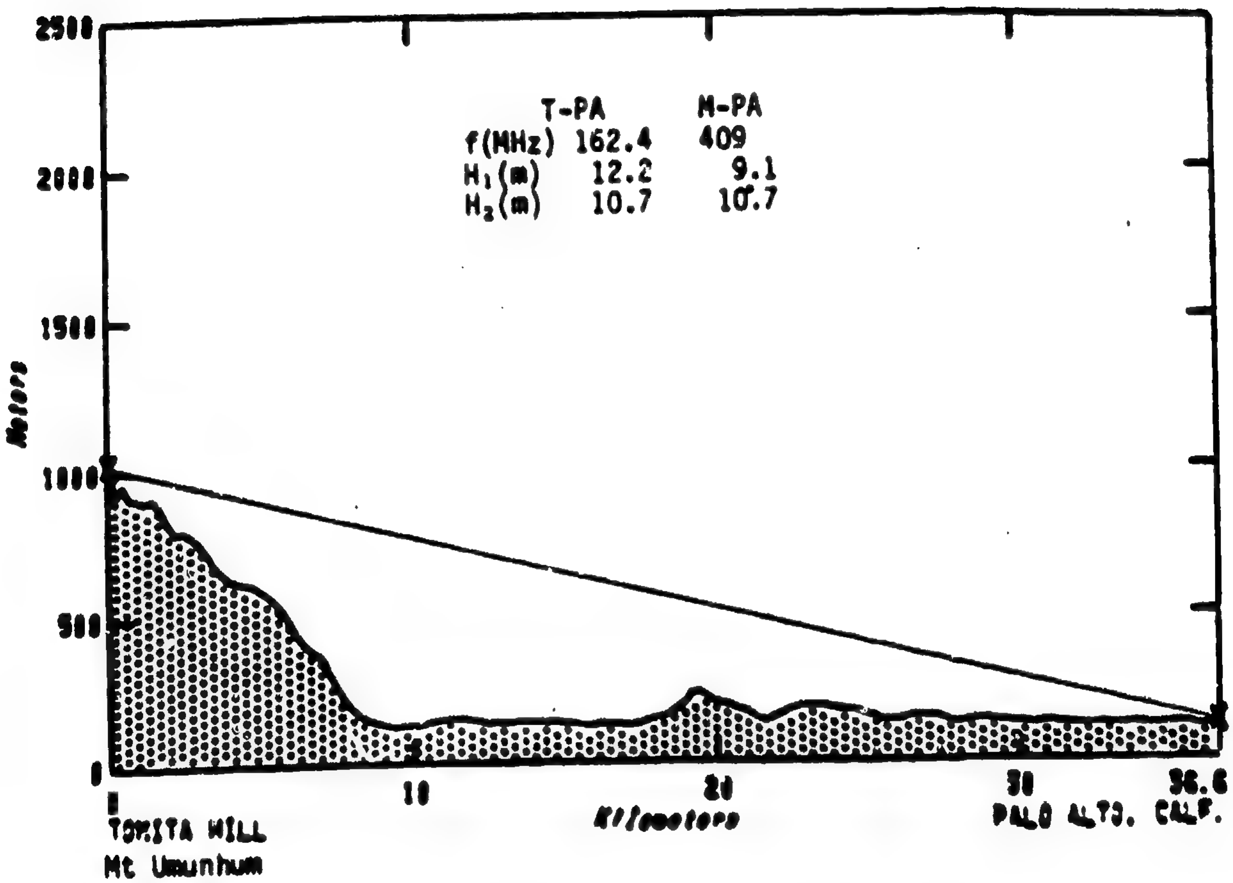


Figure 355. Paths 30001 and 30005, profile, Tomita Hill to Palo Alto and Mt. Umunhum to Palo Alto.

Path Number: _ _ _ 3 0 0 0 1

Code Number: 1 1 2 1 1 0 0 4 5 2 0 1 2 5 0 1

Location: *Tomita Hill, California - Palo Alto, California*

Data type *signal levels*, Distance 36.6 km, h_{rs} ______ m-msl

N_o 330 N-units, a ______ km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency 162 MHz, Transmitter output 24.4 dBW, EIRP ______ dBW

Δh 637 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1018	155.5
gain [dBi], main beam	-6	2
height [m], above site surface	12.2	10.7
line loss [dB]	1	3.5
polarization	V	V
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	37°09'38"N	37°24'34"N
longitude	121°54'25"W	122°10'42"W
Path bearing		
elevation [m-msl]		

Other information:

Figure 356. Path 30001, parameters.

Path Number: _ _ _ 3 0 0 0 5

Code Number: 1 1 2 1 1 0 0 4 5 2 0 1 2 5 0 1

Location: *Mt. Umunhum, California - Palo Alto, California*

Data type *signal levels*, Distance 36.6 km, h_{rs} ____ m-msl

N_s 330 N-units, a ____ km, Surface type *average ground*

Climate *maritime temperate overland*, d_s ____ km

Frequency 409 MHz, Transmitter output 24.4 dBW, EIRP ____ dBW

Δh 637 m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1018	155.5
gain [dBi], main beam	-6	2
height [m], above site surface	12.2	10.7
line loss [dB]	1	3.5
polarization	V	V
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	37°09'38"N	37°24'34"N
longitude	121°54'25"W	122°10'42"W
Path bearing		
elevation [m-msl]		

Other information:

Figure 357. Path 30005, parameters.

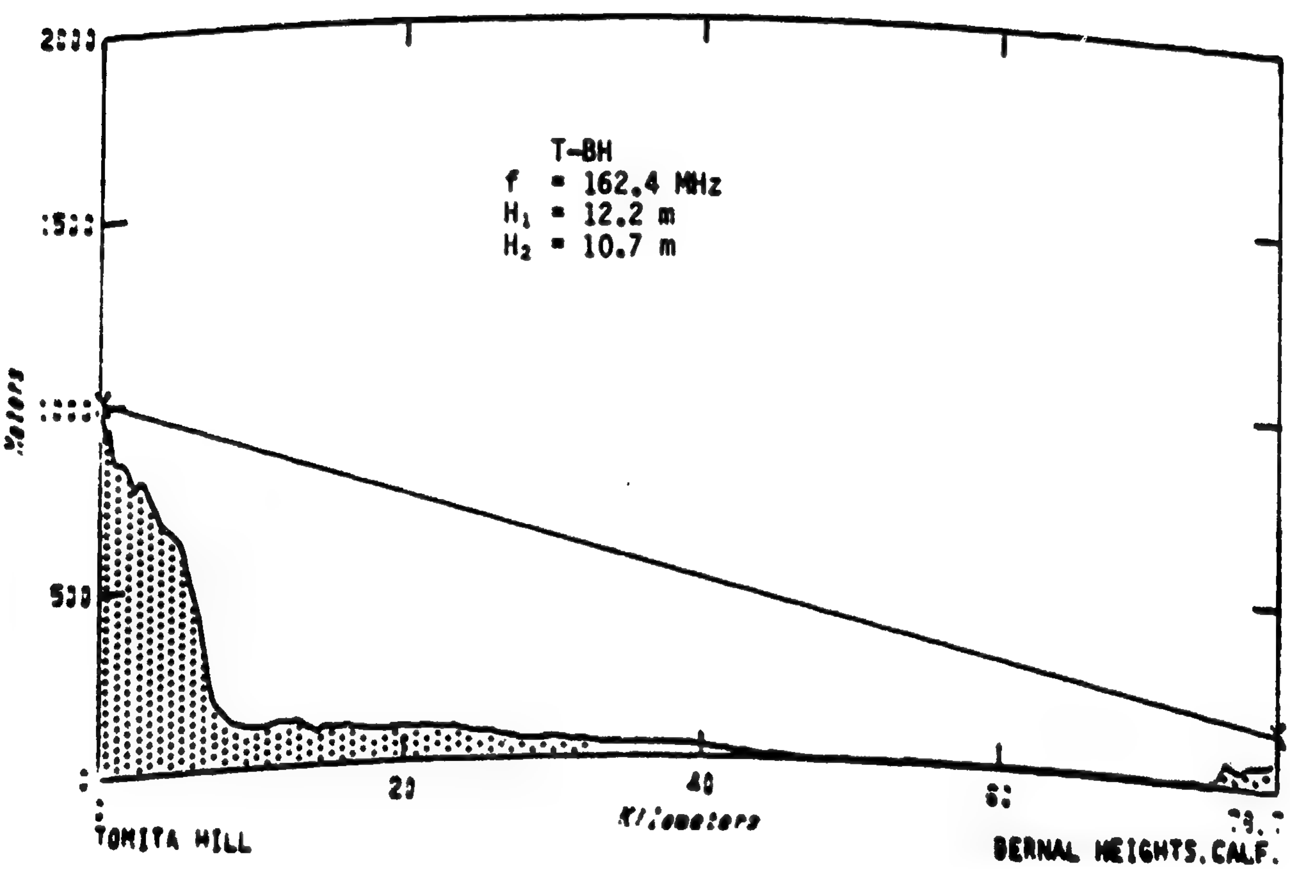


Figure 358. Path 30002, profile, Tomita Hill to Bernal Heights.

Path Number: _ _ _ 3 0 0 0 2

Code Number: 1 1 2 1 1 0 0 4 5 2 0 1 2 5 0 1

Location: *Tomita Hill, California - Bernal Heights, California*

Data type *signal levels*, Distance *78.7* km, h_{rs} ______ m-msl

N_o *330* N-units, a ______ km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency *162.4* MHz, Transmitter output *24.4* dBW, EIRP ______ dBW

Δh *353* m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	1018	157
gain [dBi], main beam	-6	2
height [m], above site surface	12.2	10.7
line loss [dB]	1	4.5
polarization	V	V
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	37°09'38"N	37°44'35"N
longitude	121°54'25"W	122°24'50"W
Path bearing		
elevation [m-msl]		

Other information:

Figure 359. Path 30002, parameters.

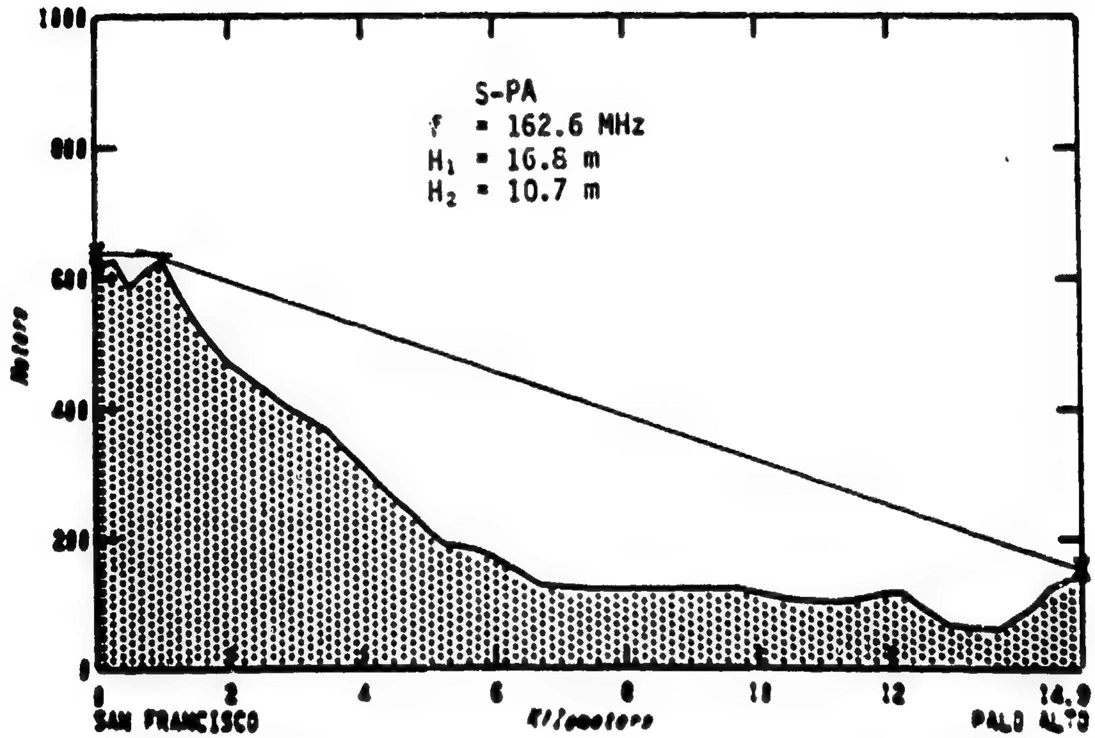


Figure 360. Path 30003, profile, San Francisco to Palo Alto.

Path Number: _ _ _ 3 0 0 0 3

Code Number: 1 1 2 1 2 1 0 4 5 2 0 1 2 5 0 1

Location: *San Francisco, California - Palo Alto, California*

Data type *signal levels*, Distance 14.9 km, h_{rs} ______ m-msl

N_o 330 N-units, a ______ km, Surface type *average ground*

Climate *maritime temperate overland*, de ______ km

Frequency 162.55 MHz, Transmitter output 24.4 dBW, EIRP ______ dBW

Δh 598 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	638	155.5
gain [dBi], main beam	10	2
height [m], above site surface	16.8	10.7
line loss [dB]	1	3.5
polarization	V	V
type		
Horizon distance [km]		13.9
elevation [m-msl]		633
elevation angle [deg]		
Location, latitude	37° 27'02"N	37° 24'34"N
longitude	122° 20'18"W	122° 10'42"W
Path bearing		
elevation [m-msl]		

Other information:

Figure 361. Path 30003, parameters.

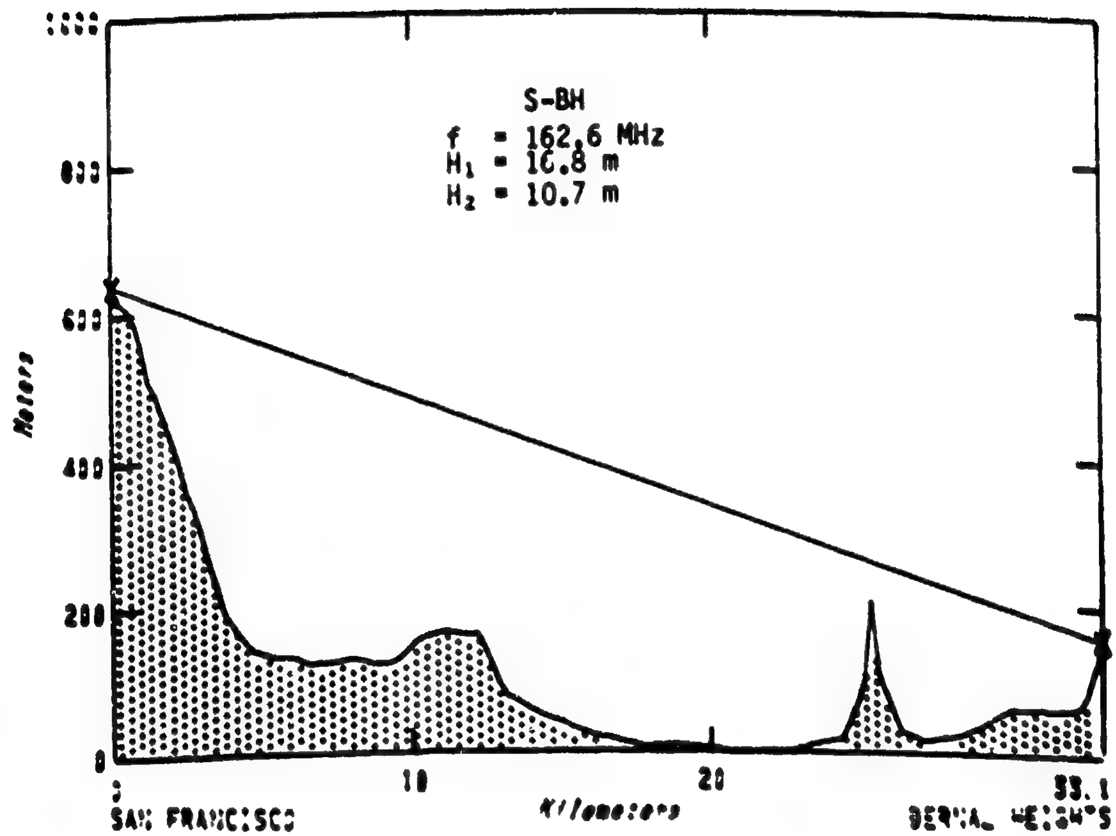


Figure 362. Path 30004, profile, San Francisco to Bernal Heights.

Path Number: ___ ___ ___ 3 0 0 0 4

Code Number: 1 1 2 1 1 0 0 4 5 2 0 1 2 5 0 1

Location: San Francisco, California - Bernal Heights, California

Data type signal levels, Distance 33.1 km, h_{rs} ______ m-msl

N_o 330 N-units, a ______ km, Surface type average ground

Climate maritime temperate overland, de ______ km

Frequency 162.55 MHz, Transmitter output 24.4 dBW, EIRP ______ dBW

Δh 359 m, θ ______ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	638	157
gain [dBi], main beam	14	2
height [m], above site surface	16.8	10.7
line loss [dB]	1	4.5
polarization	V	V
type		
Horizon distance [km]		7.6
elevation [m-msl]		205
elevation angle [deg]		
Location, latitude	37°27'02"N	37°44'35"N
longitude	122°20'18"W	122°24'50"W
Path bearing		
elevation [m-msl]		

Other information:

Figure 363. Path 30004, parameters.

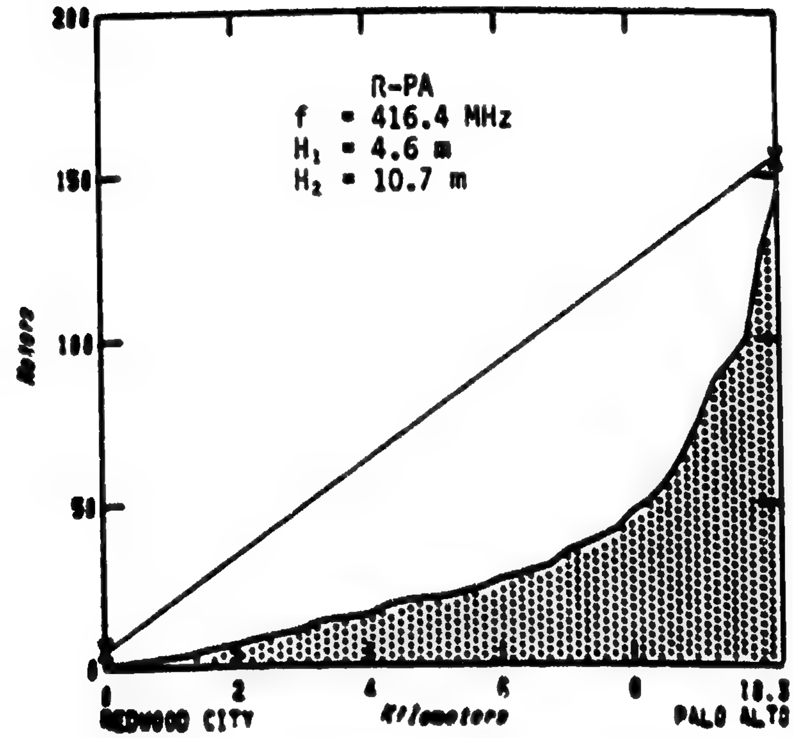


Figure 364. Path 30006, profile, Redwood City to Palo Alto.

Path Number: _ _ _ 3 0 0 0 6

Code Number: 1 1 2 4 1 0 0 4 5 2 0 1 2 5 0 1

Location: *Redwood City, California - Palo Alto, California*

Data type *signal levels*, Distance *10.3* km, h_{rs} ____ m-msl

N_o *330* N-units, a ____ km, Surface type *average ground*

Climate *maritime temperate overland*, de ____ km

Frequency *416.4* MHz, Transmitter output *11.8* dBW, EIRP ____ dBW

Δh *99* m, θ ____ mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	5.8	155.5
gain [dBi], main beam	7	2 '
height [m], above site surface	4.6	10.7
line loss [dB]	3	1.5
polarization	V	V
type		
Horizon distance [km]		
elevation [m-msl]		
elevation angle [deg]		
Location, latitude	37°29'33.5"N	37°24'34"N
longitude	122°13'45"W	122°10'42"W
Path bearing		
elevation [m-msl]		

Other information:

Figure 365. Path 30006, parameters.

5. ACKNOWLEDGMENTS

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Source Number 1

Reference: Longley, A. G., R. K. Reasoner, and V. L. Fuller (1971), Measured and predicted long-term distributions of tropospheric transmission loss, OT Telecomm. Res. and Eng. Rept. OT/TRER 16 (NTIS, COM-75-11205).

Abstract: This report summarizes measurements of tropospheric transmission loss and its long-term variability for nearly 800 paths in various parts of the world. The measurements were made at frequencies from 40 MHz to 10 GHz over distances which range from 10 to 1000 km. Terrain profiles and cumulative distributions of both observed and predicted losses are plotted for more than 500 of these paths. A preliminary analysis of differences between observed and predicted values is included.

Key Words: Cumulative distributions, location variability, long-term variability, measurements, predictions, tropospheric propagation.

Remarks: This source contains approximately 2.89 million hours of data of which about 866,000 hours are associated with the paths used in this report.

Figure A1. Source 1 information sheet.

APPENDIX A. AERONAUTICAL PROPAGATION DATA POOL

To aid in the validation and improvement of propagation models such as the IF-77 model, NTIA/ITS has started to pool data relevant to tropospheric radio propagation over aeronautical type propagation paths; i.e., paths such as air/ground, air/air, ground/satellite, and point-to-point paths where at least one antenna is high enough so that terrain is not an important consideration or is only an important consideration for one terminal. This data pool may be considered as an extension of the tropospheric radio propagation data pool [26] to include aeronautical paths.

Data source documents are retained at NTIA/ITS, and data are extracted from them as required. Information concerning the sources of the data used in this report are provided in Section A.1.

To aid in managing the data, a path number and a code number are assigned to each path. These are discussed in Section A.2.

Path parameters are tabulated on a parameter sheet to allow ready access to path parameter information. The form used for this purpose is the form used to provide such information throughout the main text of this report. However, an item-by-item discussion of the form is provided in Section A.3.

A.1 SOURCE INFORMATION

Information on source documents for data assigned to the aeronautical propagation data pool is summarized on source information sheets. The information contained on such sheets consists of the source number, document reference, abstract, key words, and other remarks that may be appropriate. Source sheets for the data sources associated with the data used in Section 4 are provided in Figures A1 through A4.

Source Number 2

Reference: Gierhart, G. D., A. P. Barsis, M. E. Johnson, E. M. Gray, and F. M. Capps (1971), Analysis of air-ground radio wave propagation measurements at 800 MHz, OT Telecomm. Res. and Eng. Rept. OT/TRER 21 (NTIS, COM-75-10830/AS).

Abstract: An analysis is presented of air-ground radio wave propagation measurements, which were performed using an airborne transmission source at approximately 6400 m above msl. Receiving antennas were slightly within and beyond line-of-sight of the airborne transmitters. Received signal level data were obtained on 823.75 MHz and 847.75 MHz. Data were analyzed for short-term and long-term statistics of basic transmission loss. Long-term fading range statistics were compared with values calculated using a modified Longley-Rice model and good (∿ 1 percent) agreement was obtained. This model appears to underestimate the long-term median transmission loss by about 3 dB.

Key words: Air-ground communications, transmission loss, tropospheric propagation, MPATI (Midwest Program on Airborne Television Instruction).

Remarks: This source contains approximately 4130 hours of measured data.

Figure A2. Source 2 information sheet.

Source Number 3

Reference: Gierhart, G. D. (1976), San Francisco RSMS propagation data--comparisons with predictions, informal oral presentation given during the Denver/Boulder Chapter IEEE/AP-S Symposium on May 7, 1976.

Abstract: During the summer of 1975, the OT/ITS Radio Spectrum Measurement System (RSMS) was deployed for the OTP in the San Francisco area to collect usage data on Federal VHF/UHF Land Mobile Radio (LMR). Signal level statistics for six "base-to-base" type paths were developed and compared with predictions made via several models. Best agreement was obtained with the IF-77 model, but the simple free space model provided good estimates for the five line-of-sight paths.

Kev Words: Land mobile radio (LMR), radio spectrum measurement system (RSMS), radio wave propagation.

Remarks: This source contains approximately 167 hours of measured data.

Figure A3. Source 3 information sheet.

Source Number 4

Reference: Everhart, R. E. (1975), Airborne measurements of VOR/Localizer signal strength and desired-to-undesired signal ratios, DOT Rept. FAA-RD-75-165, I (NTIS; ADA 030502).

Abstract: This report contains the results of airborne tests to obtain VHF Navaid signal strength measurements and also facility flyability recordings with two different Localizer and VOR Facility spacings. The tests were conducted with the VOR and Localizer transmitters on adjacent channels. The data presented are measurements of the signal strengths of the facilities examined as well as crosspointer deviation and flag currents.

Volume I - VOR and Localizer Free Space Interactions, Chickasha, Oklahoma.

Key Words: VOR, localizer, field strength signal ratios, spectrum management.

Remarks:

(1) The VOR and ILS localizer signals were measured and recorded simultaneously.

(2) D/U ratios are plotted for simultaneous measurements. This source contains approximately 20 hours of measured data.

Figure A4. Source 4 information sheet.

A.2 PATH AND CODE NUMBERS

To aid in the managing of the data and path numbers, a path code number is assigned to each path that is associated with data in the aeronautical propagation data pool.

Path numbers are in two parts where the portion of the number to the left of the fourth place is the source number (Sec. 4.1). The four right-hand numbers are the path numbers used within the source document or are somewhat arbitrarily assigned to the paths considered in the document, usually by order of occurrence. For example, in 10031, 1 is the source number and 31 is the path number assigned to this path in the source document (Fig. 42).

Code numbers are used to characterize paths (or documents) so that sorting to obtain paths with particular characteristics can easily be accomplished. Two digits of the 16 digit code number are used for each of eight categories as illustrated in Figure A5. Code numbers within each category are defined in Tables A1 through A8, where each figure relates to a different category. Note that many numbers are currently undefined so that growth can be accommodated.

SAMPLE CODE NUMBER

DIGITS 0 2 1 4 3 0 0 4 5 2 1 1 0 7 3 1

DIGITS	CATEGORY	TABLE	TRANSLATION
1 & 2	Data	A1	02: Propagation data
3 & 4	Frequency	A2	14: VHF (30 to 300 MHz)
5 & 6	Propagation	A3	30: Forward scatter-general
7 & 8	Path	A4	04: Point-to-point
9 & 10	Topical	A5	52: Irregular terrain
11 & 12	Variability	A6	11: Hourly median
13 & 14	Location	A7	07: Middle latitude
15 & 16	Source	A8	31: Technical journal

Figure A5. Code number categories.

Table A1. Path Code Number, Content

01	Propagation theory
02	Propagation data
03	Both of above
04	Meteorological theory
05	Meteorological data
06	Both of above
07	Terrain theory
08	Terrain data
09	Both of above
10	Predictions
11	Data and prediction
12	D/U ratios

Table A2. Path Code Number, Frequency

01	General
10	VLF (to 30 kHz)
11	LF (30 to 300 kHz)
12	MF (300 to 3000 kHz)
13	HF (3 to 30 MHz)
14	VHF (30 to 300 MHz)
15	UHF (300 to 3000 MHz)
16	SHF (3 to 30 GHz)
17	EHF (30 to 300 GHz)
18	Over 300 GHz
19	Microwave
20	20 to >100 MHz
21	100 to 200 MHz
22	200 to 300 MHz
23	300 to 400 MHz
24	400 to 500 MHz
25	500 to 600 MHz
26	600 to 700 MHz
27	700 to 800 MHz
28	800 to 900 MHz
29	900 to 1000 MHz
31	1 to 2 GHz
32	2 to 3 GHz
33	3 to 4 GHz
34	4 to 5 GHz
35	5 to 6 GHz
36	6 to 7 GHz
37	7 to 8 GHz
38	8 to 9 GHz
39	9 to 10 GHz
41	10 to 20 GHz
42	20 to 30 GHz
43	30 to 40 GHz
44	40 to 50 GHz
45	50 to 60 GHz
46	60 to 70 GHz
47	70 to 80 GHz
48	80 to 90 GHz
49	90 to 100 GHz
51	100 to 200 GHz
52	200 to 300 GHz
53	300 to 400 GHz
54	400 to 500 GHz
55	500 to 600 GHz
56	600 to 700 GHz
57	700 to 800 GHz
58	800 to 900 GHz
59	900 to 1000 GHz
60	Over 1000 GHz

Table A3. Path Code Number, Propagation

01	General
10	Line-of-sight
20	General diffraction
21	Single knife edge
22	Rounded knife edge
23	Rounded earth
24	Double knife edge
25	Multiple knife edge
30	Forward scatter-general

Table A4. Path Code Number, Path

01	General
02	Area (prediction)
03	Broadcast
04	Point-to-point
05	Ground to air
06	Air to ground
07	Air to air
08	Ground to satellite
09	Air to satellite
10	Satellite to satellite

Table A5. Path Code Number, Topical

01	General
10	Equipment-general
11	Antennas
20	Reflection coefficient
21	Divergence
22	Sea state or reflection
23	Multipath
24	Folding
30	Meteorology-general
31	Climates
32	Ray bending
33	Atmospheric absorption
35	Rain attenuation
40	Ionospheric scintillation
50	Terrain-general
51	Smooth earth
52	Irregular terrain
53	Sea state
55	Buildings
56	Foliage
59	Surface constants
70	Nav aids
71	ILS localizer
72	VOR
73	VORTAC
74	TACAN
75	MLS
76	Glide slope

Table A6. Path Code Number, Variability

01	General
10	Long term
11	Hourly medians
20	Short term
30	Location variability

Table A7. Path Code Number, Location

01	General
02	N Hemisphere
03	S Hemisphere
04	Artic
05	Antartic
06	Equatorial
07	Middle latitude
11	Mountains
12	Plains
13	Sea coast
14	Sea
20	United States
21	NE Sea Board
22	SE Sea Board
23	Gulf Coast
24	Great Lakes
25	South Pacific Coast
26	NW Coast
27	Rocky Mountains
28	Central Plains
30	Europe
31	British Isles
32	Germany
33	Mediterranean
34	English Channel
35	North Sea
36	Scandinavia
37	Italy
40	Asia
41	S Vietnam
42	Malay Peninsula
43	India
44	Korea
45	Japan
50	Australia
60	Canada
61	East Coast
62	Hudson Bay
63	Great Lakes
64	Central Plain
65	West Coast
66	Yukon
67	Northeast

Table A8. Path Code Number, Source

01	Informal talk
02	Private letter
03	Working papers
10	Technical memorandum
11	Technical report
12	Monograph
13	Unpublished report
21	Paper presented at conference
22	CCIR documents
23	ICAO documents
31	Technical journal
32	Scientific magazine
33	General magazine
41	Book
42	Encyclopedia
43	Atlas

A.3 PATH PARAMETERS

Path parameter sheets have been used previously in this report; e.g., Figure 1. They provide information on the path, much of which is useful in making propagation predictions. A sample parameter sheet form is shown in Figure A6. A short discussion of each parameter sheet item is provided in the remainder of this section. These discussions are ordered as their subject items are ordered in Figure A6.

PATH NUMBER. This is a unique number assigned to each path (Sec. A.2).

CODE NUMBER. This is a code number used to characterize the path (Sec. A.2).

LOCATION. This is the name(s) associated with the transmitter and receiver location such as a city.

DATA TYPE. This is a brief characterization of the kind of data such as "hourly median variability of received power" or "instantaneous voltage across receiver input versus path length."

DISTANCE. this is the great circle distance between the transmitting and receiving antennas. It is often used as an independent variable in graphs associated with the IF-77 model and is required in such cases to relate propagation predictions to measured data.

h_{rs}. This is the effective reflecting plane elevation above msl. It is related to an optional input parameter (Table 4) of the IF-77 model [21, Sec. 4.1, EFFECTIVE REFLECTION SURFACE ELEVATION discussion].

N_s or N_o. Surface refractivity or surface refractivity referred to sea level are optional input parameters (Table 4) of the IF-77 model [21, Sec. 4.1, REFRACTIVITY discussion].

Path Number: ____ ____

Code Number: ____ ____ ____ ____

Location:

Data type____________, Distance________km, h_{rs}________m-msl

N_s ________N-units, a________km, Surface type____________

Climate______________________, d_s____________km

Frequency________MHz, Transmitter output________dBW, EIRP________dBW

Δh________m, θ________mr.

	Transmitter	Receiver
Antenna elevation [m-msl]	________	________
gain [dBi], main beam	________	________
height [m], above site surface	________	________
line loss [dB]	________	________
polarization	________	________
type	________	________
Horizon distance [km]	________	________
elevation [m-msl]	________	________
elevation angle [deg]	________	________
Location, latitude	________	________
longitude	________	________
Path bearing	________	________
elevation [m-msl]	________	________

Other information:

Figure A6. Sample parameter sheet.

a. Effective earth radius is an optional input parameter (Table 4) of the IF-77 model [21, Sec. 4.1, REFRACTIVITY discussion].

SURFACE TYPE. This is the type of surface (e.g., average ground, sea water, etc.) that characterizes the portion of the earth's surface from which surface reflection may occur. It is an optional parameter (Table 4) of the IF-77 model [21, Sec. 4.1, SURFACE TYPE OPTIONS discussion].

CLIMATE. This is the climate type (e.g., continental temperate, maritime oversea, etc.) most applicable to the path. It is an optional input parameter (Table 4) for the IF-77 model [21, Sec. 4.1, TIME AVAILABILITY CLIMATES OR TIME BLOCKS discussion].

d_e. Effective distance as computed by the IF-77 model [16, Sec. 4.3, CLIMATES discussion].

FREQUENCY. Radio frequency is a primary input parameter (Table 4) of the IF-77 model [21, Sec. 4.1, FREQUENCY discussion].

TRANSMITTER OUTPUT. Transmitter output power may be used to determine the EIRP of the transmitting antenna, but is not an input parameter to the IF-77 model.

EIRP. Equivalent isotropically radiated power is the power radiated from the transmitter increased by the antenna's main beam gain. It is an optional input parameter (Table 4) for the IF-77 model [21, Sec. 4.1, EIRP discussion].

Δh. The terrain parameter developed by Longley-Rice [24, Sec. 2-2] is an optional input parameter (Table 4) of the IF-77 model [21, Sec. 4.1, TERRAIN PARAMETER discussion].

THETA. This is the angle between radio horizon rays in the great circle plane defined by antenna locations [33, Sec. 6]. This angle is sometimes called "angular distance," "scatter angle," "diffraction angle," or just "theta." It is a key parameter in propagation via forward scatter and diffraction and is sometimes used to characterize data collected over such paths. Values for theta are calculated within the IF-77 model from path geometry.

ANTENNA ELEVATION. These are the elevations of the transmitting and receiving antennas above mean-sea-level (msl). They are primary input parameters (Table 4) of the IF-77 model [21, Sec. 4.1, AIRCRAFT (OR HIGHER) ANTENNA and FACILITY (OR LOWER) ANTENNA HEIGHT discussions].

ANTENNA GAIN [dBi], MAIN BEAM. These are the main beam antenna gains. They are optional input parameters (Table 4) to the IF-77 model [21, Sec. 4.1, GAIN, RECEIVING ANTENNA discussions].

ANTENNA HEIGHT ABOVE SITE SURFACE. These are the elevations of the earth's surface just below the transmitting and receiving antenna. They are related to an optional input parameter (Table 4) of the IF-77 model [21, Sec. 4.1, TERRAIN ELEVATION discussion].

ANTENNA LINE LOSS. Line losses are used to obtain transmitting antenna input power from transmitter output power or receiver input power from receiving antenna output power. Here line loss is taken to mean all losses associated with the transmission line between the transmitter and transmitting antenna or the receiving antenna and receiver.

ANTENNA POLARIZATION. Polarization is an optional input parameter (Table 4) of the IF-77 model [21, Sec. 4.1, FACILITY ANTENNA POLARIZATION OPTIONS discussion].

ANTENNA TYPE. This is a brief note concerning the kinds of antennas used at the transmitter and receiver (e.g., dipole, dish, etc.). Some specific antenna type options (Table 4) are available in the IF-77 model [21, Sec. 4.1, FACILITY ANTENNA TYPE OPTIONS discussion]. Other types of antennas are handled if the vertical patterns are known.

HORIZON DISTANCE. These are antenna-to-radio-horizon distances. They are related to an optional input parameter (Table 4) of the IF-77 model [21, Sec. 4.1, HORIZON OBSTACLE DISTANCE from FACILITY discussion].

HORIZON ELEVATION. These are radio horizon elevations for the transmitter and receiver. They are related to an optional input parameter (Table 4) for the IF-77 model [21, Sec. 4.1, HORIZON OBSTACLE HEIGHT discussion].

HORIZON ELEVATION ANGLE. These are the radio horizon elevation angles at the transmitter and receiver. They are related to an optional input (Table 4) parameter of the IF-77 model [20, Sec. 4.1, HORIZON OBSTACLE ELEVATION ANGLE ABOVE HORIZONTAL AT FACILITY discussion].

LOCATION LATITUDE, LONGITUDE. These provide transmitter and receiver locations.

PATH BEARING. The bearing of the transmitter site from the receiving site is listed under transmitter bearing and vice versa.

PATH ELEVATION. These are the path (terrain) elevations at the transmitting and receiving sites.

OTHER INFORMATION. Any other information that is pertinent to the path (or data) may be listed here; i.e., the source of the information.

APPENDIX B. ABBREVIATIONS, ACRONYMS, AND SYMBOLS

This list includes most of the abbreviations, acronyms, and symbols used in this report. Many are similar to those previously used in other reports [15, 16, 20].

In the following list, the English alphabet precedes the Greek alphabet, letters precede numbers, and lower-case letters precede upper-case letters. Miscellaneous symbols and notations are given after the alphabetical items.

a	Effective earth radius [5, Eq. 20].
ADUDD	A program name [21, Table 1].
ARD	Aviation Research and Development.
ATOA	A program name [21, Table 1].
A/C	Aircraft.
CCIR	International Radio Consultative Committee.
dB	Decibels, 10 log (dimensionless ratio of powers).
dBi	Antenna gain in decibels greater than isotropic.
dBm	Power in decibels greater than 1 milliwatt.
dBW	Power in decibels greater than 1 watt.
d_e	Effective distance [15, Eq. 177].
d_o	The largest distance in the line-of-sight region at which diffraction effects associated with terrain are considered negligible [16, Eq. 61].
DME	Distance Measuring Equipment.
DOC	United States Department of Commerce.
DOT	United States Department of Transportation.
D/U	Desired-to-undesired signal ratio [dB] available at the output of an ideal (loss less) receiving antenna.

EHF	Extremely High Frequency.
EIRP	Equivalent isotropically radiated power [dBW].
ESSA	Environmental Science Services Administration.
ESSA-1970	A propagation model (Table 2).
f	Frequency.
fss	Facility site surface.
ft	Feet.
FAA	Federal Aviation Administration.
FCC	Federal Communications Commission.
F.S.	A level based on the Free Space propagation model (Table 2).
GHz	Gigahertz (10^9 Hz).
GMF	Government Master File of frequency assignments.
h_{rs}	Effective reflecting plane elevation above msl [Sec. A.3].
H	Horizontally polarized antenna.
HF	High Frequency (3 to 30 MHz).
ICAO	International Civil Aviation Organization.
IEEE	Institute of Electrical and Electronic Engineers.
IF-73	ITS-FAA-1973 propagation model (Sec. 3).
IF-77	ITS-FAA-1977 propagation model (Table 2).
ILS	Instrument Landing System.
ITS	Institute for Telecommunication Sciences.
kHz	Kilohertz (10^3 Hz).
km	Kilometer (10^3 m).
LF	Low Frequency (30 to 300 kHz).
LMR	Land Mobile Radio.

LOC	Horizontal guidance portion (LOCalizer) of the instrument landing system.
L_{bf}	Basic transmission loss; i.e., between isotropic antennas.
L_{bm}	Median basic transmission loss.
m	Meters.
msl	Mean sea level.
MAX|ΔL|	MAXimum absolute value of ΔL with the sign of ΔL retained.
MF	Median Frequency (300 to 3000 kHz).
MHz	Megahertz (10^6 Hz).
MLS	Microwave Landing System.
MPATI	Midwest Program on Airborne Television Instruction.
n mi	Nautical miles.
Nm	Nautical miles.
NTIA	National Telecommunications and Information Administration.
NTIS	National Technical Information Service.
N_o	Minimum monthly mean surface refractivity (n-units) referred to mean sea level (Sec. A.3).
N_s	Minimum monthly surface refractivity [N-units] (Sec. A.3).
N-units	Units of refractivity corresponding to (refractive index -1) × 10^6.
OT	Office of Telecommunications (an agency that has been replaced by NTIA).
OT/TRER-21	The propagation model used in the OT/TRER-21 report (Table 2).

P_R	Median received power levels as used in Equation 2.
r	Ray path length.
rms	Root mean square.
RD	Research and Development service of the FAA.
RSMS	Radio Spectrum Measurement System.
SHF	Super-High Frequency (3 to 30 GHz).
TACAN	TACtical Air Navigation, an air navigation aid used to provide aircraft with distance and bearing information.
TN101	A propagation model that uses the methods and equations of Technical Note 101 (Table 2).
UHF	Ultra High Frequency (300 to 3000 MHz).
V	Vertically polarized antenna.
VHF	Very High Frequency (30 to 300 MHz).
VLF	Very Low Frequency (to 30 kHz).
VOR	VHF Omni-Directional Range, an air navigation aid used to provide aircraft with bearing information.
VORTAC	A combined VOR and TACAN facility.
Δh	Terrain parameter used to characterize terrain.
ΔL	Difference between the predicted and the observed median basic transmission loss (Table 3).
$\overline{\Delta L}$	Mean value of ΔL.
θ	Scattering angle used in tropospheric scatter calculations. It is the angle between transmitter horizon to common volume ray and the common volume to receiver horizon ray as both leave their crossover point.
θ_h	Direct ray arrival angle used on MPATI profile Figures 32, 34, 38, and 40.

μV	Microvolts (10^{-6} volts).
Ω	Ohms.
$(\ldots)^{\circ}$	Degrees; e.g., 12°.
$(\ldots)'$	Minutes; e.g., $32'$.
$(\ldots)''$	Seconds; e.g., $14''$.
$^{\circ}C$	Degrees Celsius.
$^{\circ}F$	Degrees Fahrenheit.
$\sim$	Approximately.

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